THE PRESIDENT'S RECOVERY PRIORITIES
Education

Ministry of Education, Science and Technology

Lesson plans for

# PRIMARY *Mathematics*

6 CLASS

2 TERM

**Foreword**

Our country's future lies in the education of our children. The Government of Sierra Leone is committed to doing whatever it takes to secure this future.

As Minister of Education, Science and Technology since 2007, I have worked every day to improve our country's education. We have faced challenges, not least the Ebola epidemic which as we all know hit our sector hard. The Government's response to this crisis – led by our President – showed first-hand how we acted decisively in the face of those challenges, to make things better than they were in the first place.

One great success in our response was the publication of the Accelerated Teaching Syllabi in August 2015. This gave teachers the tools they needed to make up for lost time whilst ensuring pupils received an adequate level of knowledge across each part of the curriculum. The Accelerated Teaching syllabi also provided the pedagogical resource and impetus for the successful national radio and TV teaching programs during the Ebola epidemic.

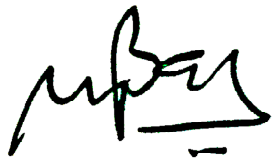
It is now time to build on this success. I am pleased to issue new lesson plans across all primary and JSS school grades in Language Arts and Mathematics. These plans give teachers the support they need to cover each element of the national curriculum. In total, we are producing 2,700 lesson plans – one for each lesson, in each term, in each year for each class. This is a remarkable achievement in a matter of months.

These plans have been written by experienced Sierra Leonean educators together with international experts. They have been reviewed by officials of my Ministry to ensure they meet the specific needs of the Sierra Leonean population. They provide step-by-step guidance for each learning outcome, using a range of recognised techniques to deliver the best teaching.

I call on all teachers and heads of schools across the country to make best use of these materials. We are supporting our teachers through a detailed training programme designed specifically for these new plans. It is really important that these Lesson Plans are used, together with any other materials you may have.

This is just the start of education transformation in Sierra Leone. I am committed to continue to strive for the changes that will make our country stronger.

I want to thank our partners for their continued support. Finally, I also want to thank you – the teachers of our country – for your hard work in securing our future.



Dr. Minkailu Bah

Minister of Education, Science and Technology

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*Mathematics*

# Introduction

## to the Lesson Plan Manual

These lesson plans are based on the National Curriculum and meet the requirements established by the Ministry of Education, Science and Technology.

1. The lesson plans will not take the whole term, so use spare time to review material or prepare for exams
2. Teachers can use other textbooks alongside or instead of these lesson plans.
3. Read the lesson plan before you start the lesson. Look ahead to the next lesson, and see if you need to tell pupils to bring materials for next time.
4. Make sure you understand the learning outcomes, and have teaching aids and other preparation ready – each lesson plan shows these using the symbols on the right.
5. Quickly review what you taught last time before starting each lesson.
6. Follow the suggested time allocations for each part of the lesson. If time permits, extend practice with additional work.
7. Lesson plans have a mix of activities for the whole class and for individuals or in pairs.
8. Use the board and other visual aids as you teach.
9. Interact with all students in the class – including the quiet ones.
10. Congratulate pupils when they get questions right! Offer solutions when they don't, and thank them for trying.


Learning outcomes


Teaching aids


Preparation

| **Lesson Title:** Making up a Plan for Data Collection | **Theme:** Statistics and Probability<br>Data Handling | |
|---|---|---|
| **Lesson Number:** M-06-061 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson pupils will be able to:<br>1. Decide on questions to ask in a survey.<br>2. By the end of the lesson pupils will be able to devise a plan for data collection. |  **Teaching Aids**<br>None |  **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** This week we are going to start thinking about statistics and gathering data. You will be working in groups of 4 or 5 to help the CEO of Ludo Game Factory come up with a plan to make the best games possible.
2. Make groups of 4 or 5 pupils and have them sit in their groups.
3. **Say:** Your team has been hired by Ludo Game Factory to research what types of board games would sell best in Sierra Leone. They are looking to expand their sales area to include Sierra Leone and must find out what games would be best received in Sierra Leone. Before we start the research work, please work in groups to create labels for yourself and your position on the research team. Your label should include your name; your position which is Research and Development, or just R&D; and the name of the company, 'Ludo Game Factory'.
4. **Write** an example of what the labels should look like on the board. Help pupils create labels from paper in their exercise books.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** In groups, please brainstorm games that you would enjoy. Write a list of possible questions to ask to find out what games others would most enjoy playing.
2. **Say:** Each group member will ask these questions of people not in your group. You should come up with at least 5 questions that you want answers to in order to create your report for the CEO of Ludo Game Factory. Remember that questions should help you decide on the best games for Ludo Game Factory to sell in Sierra Leone.
3. Have pupils work on questions for 5 minutes.
4. **Say:** Now that questions are prepared, please talk amongst your group to see how you will record the answers to your questions. Each group member must use the same method for recording data. Discuss how many people each person will ask the questions to. Once you have your plan, we will practice.
5. Groups should devise their initial plans for the remaining time.
6. **Say** and **write**: Remember that your plan should include the following:
    a. Questions you want to ask.
    b. How you will collect the data.

c. How you will record the data.
d. Your questions must collect numerical data. For example, 'How many minutes a day do you play games?' or you can give options of types of games like racing/driving, word puzzle or fighting types. That way you collect data on how many or how much and then you can analyse the numerical data that you collect.

**Guided Practice** *(10 minutes)*

1. **Say:** Now that you have a plan, we must practice collecting and recording data. Each member of your group will practice collecting data with five other pupils that are not in their group. Please make sure you follow your research team's plan for collecting and recording data.
2. Give pupils the remaining time to collect pilot data.

**Independent Practice** *(10 minutes)*

1. **Say:** Now that you have collected your pilot data, please return to your groups. Check with your groups to see if each member followed the plan and discuss any problems with your questions. If there are problems with any questions, see if you can revise them as a team to make them better. Look for patterns in responses to see if the information will help you create your final report for the CEO of Ludo Game Factory.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue working on our plan, so please bring your notes. Practice asking your questions and collecting data with people you see during the day. This will not be your final data collection, but it will help your group make your questions better tomorrow.

| **Lesson Title:** Making up a plan for data collection | **Theme:** Statistics and probability<br>Data Handling | |
|---|---|---|
| **Lesson Number:** M-06-062 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Decide on questions to ask in a survey.<br>2. Devise a plan for data collection. | **Teaching Aids**<br>None | **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** To start class today, please sit with your Ludo Game Factory research groups.
2. Allow pupils to move their seats, if necessary.
3. **Say:** Today we are going to work together to see if our questions help us decide which games and types of games the Ludo Game Factory should sell in Sierra Leone.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** In groups, please review the responses that you received from your questions. See if there are any patterns in the responses. If there are, then your questions are giving you good information to report back to the CEO of Ludo Game Factory. If there are no patterns, work in groups to change your questions to get data that will help you form a report. Remember, you need data that shows how many or how much so that you have numerical data. We will be using the numerical data later in our reports when we do calculations and draw data representations.
2. Have pupils work on reviewing their questions and results for 5 minutes.
3. **Say:** Discuss in groups who would be the best people to ask your questions to. Should you ask adults or children? Shopkeepers? Teachers? Anyone else? Create a plan of whom each member will interview to collect data.
4. Pupils work in groups to create a plan for interviewing strategies.

**Guided Practice** *(10 minutes)*

1. **Say:** Now that you have a plan for who you will interview and the questions you are going to ask, you will now reevaluate your data collection methods.
2. **Say**: Please look at the data you collected and ask:
    a. Was it neat and organised?
    b. Was each member able to use the data collection method and organise his or her data neatly?
    c. Are there things that you can update to make data collection and organisation easier for all group members?

3. Take this time to discuss how the data was collected, recorded and organised. You may need to fix or update this part of the plan.
4. Pupils work in groups to finalise their data collection plan.

**Independent Practice** *(10 minutes)*

1. **Say:** Now that each research team has finalised their plans, one member of each group will briefly share their group's plan. Take one minute to decide who in the group will share the information.
2. Groups will decide on one member to share the information. Then call on each group to report out their information. This will allow groups to see the differences and similarities in their plans.

**Closing** *(2 minutes)*

1. **Say:** Good work everyone! Tomorrow we will put our plans into action. You will work as a team to collect data.

| **Lesson Title:** Putting the Data Collection Plan into Action | **Theme:** Statistics and Probability<br>Data Handling | |
|---|---|---|
| **Lesson Number:** M-06-063 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Put a data collection plan into action.<br>2. Organise and work in a team as data collectors. |  **Teaching Aids**<br>None |  **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Today you are going to implement your data collection plan. If you are not already sitting in research teams, please move your seats.
2. Pupils should change their seats to be with their groups.
3. **Say:** Each team member should take out his or her exercise book with his or her data collection plan.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** In groups, take two minutes to make sure everyone knows what is expected of them as groups go out to collect data.
2. Allow groups to discuss for 2 minutes.
3. **Say:** In groups, take fifteen minutes to collect all of your data. Remember, as a team, you want to ask your questions to as many pupils as possible.
4. Pupils should go out in groups to collect the data. They will return in about 15 minutes.

**Guided Practice** *(10 minutes)*

1. Pupils are collecting the data for much of this time. Watch to make sure that groups are collecting the data. Pupils may be asking other pupils, or people around the school. Pupils will then return to class.
2. **Say:** Good job collecting the data! We will now take some time to look over the data to ensure it is organised and easy to read. Please rewrite your data to make it easier to read and interpret. You will be using the data tomorrow.

**Independent Practice** *(10 minutes)*

1. **Say:** Your questions will have given you different types of data. Some of the answers to your questions may have been words or phrases and other data may have been numerical data. As you organise your data now, please separate the numerical data from the word-based data. This will help you interpret the data tomorrow.

2. Groups will look over the data. They will rewrite data on a new page in their exercise books to have a clean and neat copy. Groups will compare individual data to ensure that all members have the same information.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will look at our numerical data to find important information regarding the data. We will see if there are any common responses or trends in the data.

| **Lesson Title:** Calculating the Mean, Median, and Mode of Discrete Data | **Theme:** Statistics and Probability<br>Data Handling | |
|---|---|---|
| **Lesson Number:** M-06-064 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to calculate the mean, median, and mode of discrete data. |  **Teaching Aids**<br>None |  **Preparation**<br>Write the data set carefully on the board for the lesson from the introduction. |

**Opening** *(3 minutes)*

1. **Say:** Now that each group has collected data, we will now learn how to interpret the data. If you are not already sitting in research teams, please move your seats.
2. Pupils should change their seats to be with their groups.
3. **Say:** When we have numerical and discrete data, there are three main characteristics of the data help us interpret what the numbers are telling us. These three things are known as the mean, median and the mode of the data. These calculations help us find the central value of our data using different methods.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** When we work with discrete data and we want to find the 'mode' and the 'median', we must write our values in order from least to greatest with values repeating if there is more than one instance of a number. In your exercise books, please write your data out in this way. Once you are done, compare your list with the lists the rest of your group makes.
2. **Write:** Here is an example that we will use to help us understand how to analyse data:
   3, 5, 6, 7, 7, 8, 9, 9, 10, 11, 13
3. Pupils should write their data in a list from least to greatest and then compare this with other group members.
4. **Say:** Now that data is listed this way, we can find the median and the mode quite easily. The mode is the number in your data that is most frequently written. In the example on the board, the 7 and 9 occur most often so it is the 'mode.' Look at your data and see which numerical value appears most frequently. Once you find that number, please write it down and label it as the mode.
5. **Write:** Mode = 7 and 9
6. Pupils should look at their data in their groups and decide on the mode. Walk around the room and help groups find the mode. Check to see that each pupil looks for the mode within their group's data.
7. **Say:** The mode tells us the most common response. This will help your research team by telling you what most people want from the Ludo Game Factory. If you asked how many people they want to play with, and the mode is four people total, then you can request that the Ludo Game Factory sells games for four players.

8. **Say:** The next piece of information you can find by listing the data from least to greatest is the median. The median tells us what the middle number in the data is. We count up and down at the same time from both ends. I will show you how with an example.
9. **Write** 3, 5, 6, 7, 7, 8, 9, 9, 10, 11, 13 on the board.
10. **Say:** If your data looks like the data on the board, we would see that the number in the middle is 8. We know this because 8 is five numbers from both the highest and lowest data value in the list.
11. Show pupils that you can cross off a number from each end of the list to get the answer. Then write 3, 5, 6, 7, 7, 8, 9, 9, 11, 13 on the board.
12. **Say:** If we were to find the median of this list of numbers, we would find that there is no number exactly in the middle. We end with both 7 and 8 left over when we cross numbers off from the upper and lower ends of the list. When this happens, we must find the average, or mean, or the two numbers. The mean of 7 and 8, in this example, is evaluated by adding 7 and 8 and dividing by 2. We divide by 2 because we are finding the mean of two values.
13. **Write** the mathematical representation of this process on the board. $\frac{7+8}{2}=\frac{15}{2}=7.5$
14. **Say:** In this example, we would say that the median value is 7.5

**Guided Practice** *(10 minutes)*

1. **Say:** Now find the median value of your data. Remember, you may need to find the mean of two values.
2. Pupils should calculate the median of their data. Walk around the room and help pupils who are struggling to find the median. After three minutes, have pupils compare their answer within their groups. If there are disagreements within the groups, please assist them in finding the correct answer or their errors.
3. **Say:** While the median gives us the middle number, there is another important value that we can figure out. That value is the 'mean', or the average, of the data. If we look at the original data list that I wrote on the board, we can find the mean.
4. Point to the original list, or rewrite the data "3, 5, 6, 7, 7, 8, 9, 9, 10, 11, 13" on the board.
5. **Say:** We've already found the mean of two numbers, but it is possible to find the mean of a much larger set of data. We would follow the same process, but it might take a little longer. To find the mean of any dataset, we add all the values and divide by the number of values. For the sample data set, we can write out the solution:
6. **Write** the solution on the board for pupils. $\frac{3+5+6+7+7+8+9+9+10+11+13}{11}=\frac{88}{11}=8$
7. **Say:** In this example, our mean is 8. It is the same thing as the median for this example, but that does not always happen.
8. **Write:**
    a. Mode: 7 or 9
    b. Median: 8
    c. Mean: 8

**Independent Practice** *(10 minutes)*

1. **Say:** Take some time to find the mean of your data. Please find the mean individually.
2. Walk around the room as pupils calculate the mean. Assist pupils who are having any difficulty. After five minutes, call their attention to the front of the room.
3. **Say:** Now discuss in groups the means that you found. Each member should have the same mean. If you do not have the same mean, please work together to find the correct mean for the collected data.
4. Groups should discuss the information and come to a consensus on their means.
5. **Say:** Once your group has a common value, please discuss what the mean, median and mode can tell you for your report. Take notes of what you discuss so you can include it in the report to the CEO of Ludo Game Factory.
6. Groups should discuss the information.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will discuss how we will be putting together a report of the findings that your group has decided on from your data.

| **Lesson Title:** Devising a Plan for a Statistical Report with the Findings of the Survey | **Theme:** Statistics and Probability<br>Data Handling | |
|---|---|---|
| **Lesson Number:** M-06-065 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

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|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to plan for writing a statistical report, including how to represent the data. |  **Teaching Aids**<br>None |  **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to talk about what to do with the data to write in our reports. Remember, you have to convince the CEO of Ludo Game Factory which games they should sell in Sierra Leone. Remember, this is the ultimate goal. Your group wants to win the contest when they present your findings.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** As groups worked, you created plans and implemented those plans. During implementation, groups collected information that must be compiled to share with the CEO of Ludo Game Factory. I want groups to talk about the information they collected and discuss what information is important to convince the CEO that your plan is the best plan. Please write all of the things you discuss in your exercise books. Groups will then share what they discussed because we will create a list of possible things to include in the report.
2. Pupils should discuss in their groups how the information can be used to convince the CEO for five to seven minutes. Walk around the classroom and see what things the different groups are discussing. (Possible Answers: questions asked; how to represent data; where to mention sample size; calculating mean, median and mode; writing up importance of mean, median and mode; conclusions)
3. **Say:** You brainstormed about the information that they gathered and what might be important. As a class, we are going to create a list of all the things that the groups brainstormed.
4. Call on groups to share their lists. Write each item on the board.

**Guided Practice** *(10 minutes)*

1. **Say:** We see that there are plenty of things that we can include in the reports. In groups, discuss the top ten things that you think would convince the CEO of Ludo Game Factory to accept your proposal. Write down your top ten list.
2. Groups should work together to cut the list to ten items. If there are less than ten items on the whole list, please have groups make a top five list. Let groups work for seven minutes.
3. **Say:** Now that you have priorities for your report, I want each group to tell me your top ten.

4. Have each group read their top ten list. Make a tally next to each response that groups give. You will do this for each item that groups read from their top ten.

**Independent Practice** *(10 minutes)*

1. **Say:** Now that we have tallied our top ten list, we can see what the five most chosen items are for the reports.
2. Look through the tally marks and highlight the five most cited items on the list. Emphasise to pupils that these five are the things that most groups wanted included in the reports.
3. **Say:** These five items are five things that must be included in your reports. Please take a minute to write them down in your exercise books.
4. **Write:**
    a. What questions you asked and why?
    b. How you collected your data, who you asked and why and what tools you used?
    c. The mean, median and mode of your data.
    d. A line chart to help you represent your data.
    e. Conclusions and key points.
5. Pupils will indicate the five items that must be in each group's reports.
6. **Say:** Now that you know which five items you must emphasise, work in groups to find this information. You are not writing the report today, but I want to make sure each group has the information required for the report. You should also discuss in groups how you would best represent the data. Write down how you will represent the data in your report.
7. Groups should work together to identify the items. Walk around the room to make sure each group has the information that is to be included in each report. Check to see that they have a plan for representing the data.

**Closing** *(2 minutes)*

1. **Say:** This week we have been working hard to collect data and learning how to interpret and represent it. Next week we will write the report with the statistical findings and then present the statistical report to the CEO of Ludo Game Factory.

| **Lesson Title:** Writing a statistical report with the findings of the survey (3 lessons) | **Theme:** Statistics and probability<br>Data Handling | |
|---|---|---|
| **Lesson Number:** M-06-066 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

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|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Write a statistical report, including how to represent the data.<br>2. Represent data using line charts.<br>3. Work out the mean, median, and mode and put it in context. |  **Teaching Aids**<br>None |  **Preparation**<br>Draw the line graph for the lesson on the board. |

**Opening** *(3 minutes)*

1. **Say:** We are going to spend the next three lessons writing up the statistical reports for the CEO of Ludo Game Factory in groups. Last week we devised a plan for writing up the statistical report. The report must include, at a minimum, the five things on that list. The report must be neat and organised.
2. Remind pupils that they need to include their calculations as well as why the calculations are important.
3. **Say:** We will also need to include line charts in order to represent the data visually for the report. Today we are going to learn how to make line charts and then we will begin writing the report.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** Line charts show data using points and by connecting those points with lines. We will create a sample line graph together and then you will create at least one line graph from your data in groups. Our sample line graph will show a pupil's favourite colour. Each of you will tell me your favorite colour between red, blue, yellow, orange, and purple.
2. Write the five colors on the board. Ask each pupil to say which colour is their favourite, and tally the responses. Then draw a pair of axes on the board with colour along the x-axis (the horizontal axis) and quantity along the y-axis (the vertical axis). Label each axis with the colours and numbers representing the responses, respectively. Then show pupils how to mark each of the values per colour. If, for example, 10 pupils said that red was their favourite colour, then you would draw a vertical line above red on the graph up to 10 to show that there were ten responses for that colour. Use the class' data to draw the graph.

**Guided Practice** *(10 minutes)*

1. **Say:** Now that we know how to make line graphs, groups will work together to decide which data will be best for a line graph. Groups will have five minutes to decide on which graphs they will make and include in their reports.
2. Walk around and assist the groups if they need help with their data for five minutes. After five minutes, call their attention to the front of the room.
3. **Say:** Now that we know how to make line graphs and we can represent the data, we will begin to write our reports. Using clean paper in one group member's exercise books, we will begin to write the report. We must include all of the information we said and the line graphs. Be sure to include the calculations of mean, median and mode and what they mean for the report. Be as convincing as you can because your group wants to convince the CEO of Ludo Game Factory that your plan for selling board games in Sierra Leone is the best.
4. Spend the rest of the class period on their reports.

**Independent Practice** *(10 minutes)*

1. Groups will work for this period on their reports. Walk around the classroom and respond to any questions as needed. Assist groups who are struggling with their reports. At the end of the class period, call their attention to the front of the room.

**Closing** *(2 minutes)*

1. **Say:** We will continue writing our reports and finalising them over the next two class days. Remember that you will submit this report and present your findings at the end of the week. Please make sure everything is neat and organised so that it is easy to read.

| | | |
|---|---|---|
| **Lesson Title:** Writing a Statistical Report with the Findings of the Survey (3 lessons) | **Theme:** Statistics and Probability<br>Data Handling | |
| **Lesson Number:** M-06-067 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Write a statistical report, including how to represent the data.<br>2. Represent data using line charts.<br>3. Work out the mean, median, and mode and put it in context. |  **Teaching Aids**<br>None |  **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to spend the whole class continuing to work on our projects. Please work together in your groups to address the essential items that are to be included in the report and make it easy to read for everyone. Make sure your group asks questions if you are unsure about something.

**Introduction to the New Material** *(10 minutes)*

1. Pupils should use the class time on their reports. Walk around and address any issues and answer questions as they arise. Continually remind pupils that they should be taking their time and that they will have another class day to put their reports together.

**Guided Practice** *(10 minutes)*

1. Pupils should use the class time on their reports. Walk around and address any issues and answer questions as they arise. Remind pupils that they should be taking their time and that they will have another class day to put their reports together.

**Independent Practice** *(10 minutes)*

1. **Say:** As you are working to finish the report, please keep in mind that you will have to present your report and findings to the class and the CEO of Ludo Game Factory. As you write your report you should be thinking about how you will present the information. Tomorrow that should be your focus during group time as well as finishing the reports.
2. Pupils should use the class time on their reports. Walk around and address any issues and answer questions as they arise. Continually remind pupils that they should be taking their time and that they will have another class day to put their reports together.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow will be the last day to write your reports and findings as well as to organise your presentations. Then each group will have 3-5 minutes to present their findings to the class.

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|---|---|---|
| **Lesson Title:** Writing a Statistical Report with the Findings of the Survey (3 lessons) | **Theme:** Statistics and Probability<br>Data Handling | |
| **Lesson Number:** M-06-068 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Write a statistical report, including how to represent the data.<br>2. Represent data using line charts.<br>3. Work out the mean, median, and mode and put it in context. |  **Teaching Aids**<br>None |  **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Today we will finish up writing our reports and organising our presentations for the next class. At the end of class time today, each group member must know their role during the presentations of the findings. There will be no time to figure that out tomorrow. Each group will have three to five minutes to present their findings.

**Introduction to the New Material** *(10 minutes)*

1. Pupils should use the class time on their reports and presentations. Walk around and address any issues and answer questions as they arise. Continually remind pupils that they should be taking their time and that today is the last day to work on reports and presentations.

**Guided Practice** *(10 minutes)*

1. Pupils should use the class time on their reports and presentations. Walk around and address any issues and answer questions as they arise. Continually remind pupils that they should be taking their time and that today is the last day to work on reports and presentations.

**Independent Practice** *(10 minutes)*

1. **Say:** As you are working to finish the report and presentations, please keep in mind that you will have to present your report and findings to the class and the CEO of Ludo Game Factory. Tomorrow groups will begin presenting their findings and reporting to the CEO of Ludo Game Factory.
2. Pupils should use the class time on their reports and presentations. Walk around and address any issues and answer questions as they arise. Continually remind pupils that they should be taking their time and that today is the last day to work on reports and presentations.
3. Five minutes before the end of class, gather students back together and review what they need to present with their groups the next day.

4. **Say** and **write**: Remember the important parts of your report you need to include:
    a. What questions you asked and why?
    b. How you collected your data, who you asked and why and what tools you used?
    c. The mean, median and mode of your data.
    d. A line chart to help you represent your data.
    e. Conclusions and key points.
5. **Say**: You must select the top pieces of information to present tomorrow during your presentation because you have a limited amount of time and you need to show the CEO of Ludo Game Factory that you can create the best product for them to launch in Sierra Leone.
6. **Say**: You will have 5 minutes to present and there are 5 members in each group so you will each present for 1 minute on the 5 important points outlined above.

**Closing** *(2 minutes)*

1. **Say:** Groups have been working hard on creating reports for the CEO of Ludo Game Factory. Tomorrow groups will begin presenting their reports and findings to convince others of the best way to sell board games in Sierra Leone. Remember that each group will only have three to five minutes to present the most important information.

| **Lesson Title:** Presenting a Statistical Report | **Theme:** Statistics and Probability<br>Data Handling | |
|---|---|---|
| **Lesson Number:** M-06-069 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to present a statistical report. |  **Teaching Aids**<br>None |  **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Today we will be presenting our findings and reports. I will be the Ludo Game Factory CEO and pupils who are not presenting will be members of the review committee. If your group is not presenting, you must listen carefully to the other presentations and take notes on what each group found. I will collect all the notes to see how well each group presented. Each group will have no more than five minutes to present and I will choose each group. After all groups have presented, I will collect the exercise books to see the reports and the notes that were taken by each of the other groups.

**Introduction to the New Material** *(10 minutes)*

1. Groups will present for the allotted time. Remind each group when they have spoken for four minutes and stop groups when their presentations have gone on for five minutes. Then thank each group for their presentation and choose the next group. Take notes on each presentation to know how each group presented. Make sure each group presents on the agreed upon topics. If not, make a note of it.

**Guided Practice** *(10 minutes)*

1. Groups will present for the allotted time. Remind each group when they have spoken for four minutes and stop groups when their presentations have gone on for five minutes. Then thank each group for their presentation and choose the next group. Take notes on each presentation to know how each group presented. Make sure each group presents on the agreed upon topics. If not, make a note of it.

**Independent Practice** *(10 minutes)*

1. Groups will present for the allotted time. Remind each group when they have spoken for four minutes and stop groups when their presentations have gone on for five minutes. Then thank each group for their presentation and choose the next group. Take notes on each presentation to know how each group presented. Make sure each group presents on the agreed upon topics. If not, make a note of it.

**Closing** *(2 minutes)*

1. **Say:** Thank you all for your presentations and for helping me decide which plan is best for introducing board games to Sierra Leone. Tomorrow we will hear from the last of the research groups and we will decide who gave the most convincing argument.

| **Lesson Title:** Presenting a Statistical Report | **Theme:** Statistics and Probability<br>Data Handling | |
|---|---|---|
| **Lesson Number:** M-06-070 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to present a statistical report. |  **Teaching Aids**<br>None |  **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Today we will continue presenting our findings and reports. I will be the Ludo Game Factory CEO and pupils who are not presenting will be members of the review committee. If your group is not presenting, you must listen carefully to the other presentations and take notes on what each group has found. I will collect all the notes to see how well each group presented. Each group will have no more than five minutes to present and I will choose each group. After all groups have presented, I will collected the exercise books to see the reports and the notes that were taken on each of the other groups.

**Introduction to the New Material** *(10 minutes)*

1. Groups will present for the allotted time. Remind each group when they have spoken for four minutes and stop groups when their presentations have gone on for five minutes. Then thank each group for their presentation and choose the next group. Take notes on each presentation to know how each group presented. Make sure each group presents on the agreed upon topics. If not, make a note of it.

**Guided Practice** *(10 minutes)*

1. Groups will present for the allotted time. Remind each group when they have spoken for four minutes and stop groups when their presentations have gone on for five minutes. Then thank each group for their presentation and choose the next group. Take notes on each presentation to know how each group presented. Make sure each group presents on the agreed upon topics. If not, make a note of it.

**Independent Practice** *(10 minutes)*

1. Groups will present for the allotted time. Remind each group when they have spoken for four minutes and stop groups when their presentations have gone on for five minutes. Then thank each group for their presentation and choose the next group. Take notes on each presentation to know how each group presented. Make sure each group presents on the agreed upon topics. If not, make a note of it.

2. Once all groups have presented, use any remaining time to review your notes and come up with the group who made the most convincing argument for how to sell board games within Sierra Leone.

**Closing** *(2 minutes)*

1. **Say:** All teams did a great job in researching, organising, and presenting their findings. All of you should be very proud of the hard work you have done. Out of all the presentations, there was one group that was the most convincing. One group had to be chosen because only one plan can be followed for selling board games in Sierra Leone. Congratulations to all groups, but especially to (say the names of pupils in the winning group) for a job well done! It was very difficult to decide which group had the most convincing argument as all groups did a fantastic job. Great work everyone!

| **Lesson Title:** Like Fractions with Denominators up to 12 (Revision) | **Theme:** Number and Numeration (Fractions) | |
|---|---|---|
| **Lesson Number:** M-06-071 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to identify, compare, and order like fractions with denominators up to 12. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** We are going to work with fractions. Some of it will be a review, while other topics will be new. The first two lessons will be revisions, or reviews, of material you should know from previous years. Today our discussion will be about like fractions. Before we start, we should remember what the parts of a fraction are.
2. **Write** the fraction $\frac{3}{5}$ on the board.
3. **Ask:** Who can tell me what the denominator of the fraction three-fifths is? (Answer: five)
4. Have pupils raise their hands to answer the question. Call on one or two pupils until the correct answer is given.
5. **Say:** Yes, the denominator of the fraction is five. Remember that the denominator is the bottom part of the fraction.
6. **Ask:** What part of the fraction does the three represent? (Answer: the numerator)
7. Have pupils raise their hands to answer the question. Call on one or two pupils until the correct answer is given.
8. **Say:** Yes, the three represents the numerator. The numerator is the top part of the fraction. Now we will use this terminology to discuss like fractions.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** Fractions come in many different ways. We have fractions, improper fractions, and mixed numbers. All three types of fractions follow similar rules when we add, subtract, multiply or divide them. Today we are going to focus on identifying like fractions. Like fractions are most simply fractions that have the same denominator. It is important that we understand and can identify like fractions to work with them.
2. **Write** two sets of three fractions on the board.
    a. $\frac{3}{5}, \frac{4}{5}, \frac{2}{5}$ (Answer: These are like fractions because they have the same denominator.)
    b. $\frac{3}{7}, \frac{3}{4}, \frac{3}{8}$ (Answer: These are not like fractions because the denominators are different.)
3. **Say:** When looking at these two sets of fractions, we can say that the first set shows like fractions because all of the denominators are the same. The denominator in each fraction is five

so each piece of the fraction is the same size. The second set of fractions does not show like fractions because the denominators are different. Each piece of the fraction is a different size. Let's think about what fractions tell us. The denominator tells us how many pieces our item is broken into. This tells us the size of the piece. The numerator tells us how many pieces are included. In the fraction $\frac{3}{5}$, we know that our whole is divided into five pieces, and we are working with three of the five pieces. When we decide on like fractions, we want all of our pieces to be the same size, or to have the same denominator.

4. **Say:** Now that we can identify like fractions, it is important that we know which fractions are bigger and how to order them. If we know all of the pieces are the same size, we know that the numerator will tell us the order. In other words, if the denominators are all the same, then we order like fractions by putting the numerators in numerical order. We can compare fractions by saying which fraction is bigger using inequalities. Let's look at the first example. If we were to order the first example of like fractions, we would say that 2 is smaller than 3 which is smaller than 4.
5. **Write** the like fractions on the board in numerical order. $\frac{2}{5}, \frac{3}{5}, \frac{4}{5}$

**Guided Practice** *(10 minutes)*

1. **Write** three sets of fractions on the board.
   a. $\frac{3}{12}, \frac{2}{12}, \frac{11}{12}, \frac{7}{12}$ (Answer: Yes; $\frac{2}{12}, \frac{3}{12}, \frac{7}{12}, \frac{11}{12}$)
   b. $\frac{2}{5}, \frac{5}{7}, \frac{6}{9}, \frac{8}{9}$ (Answer: No)
   c. $\frac{2}{11}, \frac{7}{11}, \frac{10}{11}, \frac{1}{11}$ (Answer: Yes; $\frac{1}{11}, \frac{2}{11}, \frac{7}{11}, \frac{10}{11}$)
2. **Say:** In your exercise books, please copy these sets of fractions. Then decide if they are like fractions. If so, please order them from least to greatest.
3. Pupils will work for 7 minutes. Walk around the classroom and assist pupils as needed.
4. **Say:** Now that you have had time to think about it, we will review the answers.
5. Go over the correct answers with pupils and write them on the board.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practice on your own. Just as before, please copy the sets of fractions in your exercise books, determine if the sets are like fractions, and order the fractions if they are like fractions. You will have 7 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** five examples on the board:
   a. $\frac{3}{1}, \frac{2}{3}, \frac{1}{2}, \frac{7}{10}$ (Answer: No)
   b. $\frac{6}{8}, \frac{2}{8}, \frac{8}{12}, \frac{7}{8}$ (Answer: No)

c. $\frac{3}{9}, \frac{2}{9}, \frac{1}{9}, \frac{7}{9}$ (Answer: Yes; $\frac{1}{9}, \frac{2}{9}, \frac{3}{9}, \frac{7}{9}$)

d. $\frac{3}{4}, \frac{2}{4}, \frac{1}{4}, \frac{4}{3}$ (Answer: No)

e. $\frac{3}{6}, \frac{4}{6}, \frac{5}{6}, \frac{2}{6}$ (Answer: Yes; $\frac{2}{6}, \frac{3}{6}, \frac{4}{6}, \frac{5}{6}$)

3. As pupils are working, walk around and assist any of them as needed. Answer any questions if they arise. Once the seven minutes is up, call their attention to the board and provide the correct answers to pupils.

**Closing** *(2 minutes)*

1. **Ask**: Are there any questions from the lesson for today?
2. Answer any questions pupils have.
3. **Say:** Great work today! Tomorrow we are going to continue working with fractions and will work with equivalent fractions.

| **Lesson Title:** Equivalent Fractions (Revision) | **Theme:** Number and Numeration (Fractions) | |
|---|---|---|
| **Lesson Number:** M-06-072 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to identify, compare, and order equivalent fractions with denominators up to 12. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Ask:** What do you know about like fractions? Raise your hand to answer.
   (Answer: The have the same denominator)
2. **Say:** Today we are going to continue talking about fractions. Yesterday we worked with like fractions which all have the same denominator. Today we are going to focus on equivalent fractions.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** Equivalent fractions are fractions that represent the same amount. They can have different denominators, but will have the same amount. One example of equivalent fractions is $\frac{1}{2}$ and $\frac{2}{4}$
2. **Write** $\frac{1}{2}$ and $\frac{2}{4}$ on the board.
3. **Say:** We know that these fractions are equivalent because we can multiply each numerator by two to get the denominator. For example, using the fraction one half, we see that 1x2 = 2 where 1 is the numerator and 2 is the denominator. The same is true for two-fourths: 2x2 = 4. Another way we can check for equivalent fractions is to multiply or divide both the numerator and denominator by the same number to get the second fraction. In our example, we see that we multiply both the 1 and 2 in one-half by 2 to get the equivalent fraction of two fourths.
4. Show the multiplication on the board by writing the following: $\frac{1\times2}{2\times2}=\frac{2}{4}$
5. **Say:** When we are ready to add fractions, we will use these skills to find equivalent denominators, but that is not the skill for today.
6. **Say:** Let's try another example and see if two fractions are equivalent by finding the common number we multiply or divide by on top or bottom.
7. **Write** $\frac{7}{9}$ and $\frac{28}{36}$ on the board.
8. **Say:** Let's first look at the denominators. They are not the same. But we can see that the 9 is a factor of 36 or 36 is a multiple of 9. Let's see how much you multiply 9 by to get 36.
9. **Write:** 9 x 4 = 36
10. **Say:** Now let's see if we can multiply the numerator by the same factor to get the other numerator.
11. **Write** $\frac{7}{9}$ x $\frac{4}{4}$ = $\frac{28}{36}$ on the board.

12. **Say**: We can also divide to find equivalent fractions. For example, 36 ÷ 4 = 9 and 28 ÷ 4 = 7. Let's see this using fractions.
13. **Write**: $\frac{28}{36} \div \frac{4}{4} = \frac{7}{9}$
14. **Say**: Now you have seen two ways to determine if fractions are equivalent. There is one last way and that uses division also. We can reduce each fraction to the lowest or simplest term and if the result is the same reduced fraction, then the two fractions are equivalent.
15. **Write** $\frac{3}{9}$ and $\frac{12}{36}$ on the board.
16. **Say:** Let's reduce each fraction and see what the fraction is in lowest terms. Remember, to reduce fractions, we divide the numerator and the denominator by the same term until we can no longer divide a common term.
17. **Write:** $\frac{3}{9} \div \frac{3}{3} = \frac{1}{3}$ and $\frac{12}{36} \div \frac{4}{4} = \frac{3}{9} \div \frac{3}{3} = \frac{1}{3}$
18. **Say:** Each fraction reduces to $\frac{1}{3}$ so they are equivalent. Now you can use some of these methods to determine equivalent fractions in the practice.

**Guided Practice** *(10 minutes)*

1. **Write** three pairs of fractions on the board.
   a. $\frac{1}{4}, \frac{3}{12}$ (Answer: Yes, $\frac{1}{4} \text{ x } \frac{3}{3} = \frac{3}{12}$)
   b. $\frac{3}{6}, \frac{4}{9}$ (Answer: No)
   c. $\frac{2}{5}, \frac{4}{10}$ (Answer: Yes, $\frac{2}{5} \text{ x } \frac{2}{2} = \frac{4}{10}$)
2. **Say:** In your exercise books, please copy these pairs of fractions. Then decide if they are equivalent fractions. You can find the common
3. Pupils will work for 7 minutes. Walk around the classroom and assist pupils as needed.
4. **Say:** Now that you have had time to think about it, we will review the answers.
5. Go over the correct answers with pupils and write them on the board. Show pupils how you know whether they are equivalent fractions or not.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practice on your own. Just as before, please copy the pairs of fractions in your exercise books and determine if the pairs are equivalent fractions. You will have 7 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** five examples on the board.

   a. $\frac{3}{5}, \frac{4}{7}$ (Answer: No)
   b. $\frac{3}{9}, \frac{2}{6}$ (Answer: Yes)
   c. $\frac{3}{5}, \frac{7}{10}$ (Answer: No)
   d. $\frac{6}{8}, \frac{8}{12}$ (Answer: Yes)

3. As pupils are working, walk around and assist them as needed. Answer any questions if they arise. Once the seven minutes is up, call their attention to the board and provide the correct answers to pupils.

**Closing** *(2 minutes)*

1. Ask: Who can name the methods to find if fractions are equivalent? Raise your hand to answer. (Answer: Multiply by a common number; divide by a common number; reduce the fractions and see if they are equal)
2. **Say:** Great work today! Tomorrow we are going to learn about different types of fractions and how to convert between types of fractions.

| **Lesson Title:** Mixed Number and Improper Fractions | **Theme:** Number and Numeration (Fractions) | |
|---|---|---|
| **Lesson Number:** M-06-073 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to convert mixed number fractions into improper fractions. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** As mentioned the other day, there are different types of fractions. We are most familiar with proper fractions, which are fractions that have a smaller numerator than denominator. There are ways, however, to use fractions to represent quantities greater than 1.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** Mixed numbers and improper fractions both represent quantities larger than 1. Mixed numbers write the whole number in front with the fraction to the right. Improper fractions have a larger numerator over a smaller denominator.
2. **Write** an example of a mixed number, $2\frac{1}{3}$, on the board and show pupils that the two represents two whole pieces and the one-third is added to the two. **Write** an example of an improper fraction, $\frac{7}{3}$, on the board. Show pupils that it is classified as an improper fraction because the numerator is larger than the denominator.
3. **Say:** Today we are going to learn how to convert mixed number fractions into improper fractions. Because each of these fraction types can represent the same amount or a number greater than 1.
4. **Say:** Let's look at the mixed number example from earlier. If we wanted to convert $2\frac{1}{3}$ to an improper fraction, we would follow a simple process. We would multiply the denominator by the whole number and add the numerator. In this example we would do three times two plus 1 to get seven. The seven becomes the new numerator and the denominator stays the same.
5. **Write** the math on the board as you talk through the example. $2\frac{1}{3}=\frac{3\times 2+1}{3}=\frac{7}{3}$
6. **Say:** We follow this process whenever we convert from a mixed number to an equivalent fraction. As you can see the two fractions I wrote earlier to describe an improper fraction and mixed number were equivalent. Let's try another example.
7. **Write:** $4\frac{1}{4}$
8. **Say:** We need to first multiply the whole number by the denominator to get 4 x 4 which is equal to 16. We then add the numerator to find the new numerator. 16 + 1 = 17. This then goes on top of the original denominator.

9. **Write:** $4\frac{1}{4} = \frac{4x4+1}{4} = \frac{17}{4}$

**Guided Practice** *(10 minutes)*

1. **Write** three mixed numbers on the board.
   a. $7\frac{4}{5}$ (Answer: $7\frac{4}{5} = \frac{5\times7+4}{5} = \frac{39}{5}$)
   b. $4\frac{7}{12}$ (Answer: $4\frac{7}{12} = \frac{12\times4+7}{12} = \frac{55}{12}$)
   c. $6\frac{8}{9}$ (Answer: $6\frac{8}{9} = \frac{9\times6+8}{9} = \frac{62}{9}$)
2. **Say:** In your exercise books, please copy the mixed numbers. Then convert the mixed numbers into improper fractions. Remember to multiply the denominator by the whole number and add the numerator. We don't change the denominator because that just tells us the size of the piece.
3. Allow pupils to work for 7 minutes. Walk around the classroom and assist pupils as needed.
4. **Say:** Now that you have had time to think about it, we will review the answers.
5. Go over the correct answers with pupils and write them on the board. Show pupils how you converted the mixed numbers to improper fractions.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practice on your own. Just as before, copy the mixed numbers in your exercise books and convert them to improper fractions. You will have 7 minutes to work. When you finish with your work, please check your answers with a partner.
2. **Write** five examples on the board.
   a. $5\frac{2}{3}$ (Answer: $5\frac{2}{3} = \frac{3\times5+2}{3} = \frac{17}{3}$)
   b. $10\frac{6}{11}$ (Answer: $10\frac{6}{11} = \frac{11\times10+6}{11} = \frac{116}{11}$)
   c. $7\frac{5}{12}$ (Answer: $7\frac{5}{12} = \frac{12\times7+5}{12} = \frac{89}{12}$)
   d. $5\frac{3}{10}$ (Answer: $5\frac{3}{10} = \frac{10\times5+3}{10} = \frac{53}{10}$)
   e. $2\frac{4}{7}$ (Answer: $2\frac{4}{7} = \frac{7\times2+4}{7} = \frac{18}{7}$)
3. As pupils are working, walk around and assist them as needed. Answer any questions if they arise. Once the seven minutes is up, call attention to the board and provide the correct answers to pupils.

**Closing** *(2 minutes)*

1. **Ask**: What is the first step to converting a mixed number to an improper fraction? Raise your hand to answer. (Answer: You multiply the whole number by the denominator.)

2. **Ask**: What is the new denominator? Raise your hand to answer. (Answer: Keep the same denominator)
3. **Say:** Great work today! Tomorrow we are going to learn how to convert from improper fractions to mixed numbers.

| **Lesson Title:** Improper and Mixed Number Fractions | **Theme:** Number and Numeration (Fractions) | |
|---|---|---|
| **Lesson Number:** M-06-074 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to convert improper fractions into mixed number fractions. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to learn how to convert in the opposite direction from what we converted yesterday. Today we will convert form improper fractions to mixed numbers. Yesterday, to convert from mixed numbers to improper fractions, we had to multiply and add to get our improper fraction. Today we will see how to do the opposite to go the other way because they are inverse operations.

**Introduction to the New Material** *(10 minutes)*

1. **Write** $\frac{52}{6}$ on the board.
2. **Say:** If we wanted to convert fifty-two sixths to a mixed number, we would have to divide. We would ask ourselves what is fifty-two divided by 6? We know that we can take out 8 sixes from 52. When we do long division, we see that the answer is 8 with a remainder of 4. This means that our mixed number equivalent to $\frac{52}{6}$ is $8\frac{4}{6}$
3. **Write** the long division on the board showing that the answer as: 8 R 4 $6\overline{)\,52}^{\,8R4}$
4. **Say:** The remainder stays in our numerator and the whole number comes out front to make our mixed number. In short, we use long division to divide the numerator by the denominator. Our solution is the whole number and the remainder is the numerator in our mixed number.
5. **Say:** Let's try another example together so we can practice our long division from earlier this year in the first term.
6. **Write**: $\frac{41}{4}$ = 41 ÷4 = $4\overline{)41}$ 10 R1, -4, 01

**Guided Practice** *(10 minutes)*

1. **Write** three improper fractions on the board:

a. $\frac{130}{12}$ (Answer: $\frac{130}{12}=10\frac{10}{12}$)

b. $\frac{79}{9}$ (Answer: $\frac{79}{9}=8\frac{7}{9}$)

c. $\frac{87}{6}$ (Answer: $\frac{87}{6}=14\frac{3}{6}$)

2. **Say:** In your exercise books, please copy the improper fractions. Then convert the improper fractions into mixed numbers. Remember to divide the numerator by the denominator to find our whole number portion of the mixed number. The remainder is the numerator portion of the mixed number. We don't change the denominator because that just tells us the size of the piece.
3. Allow pupils to work for 7 minutes. Walk around the classroom and assist pupils as needed.
4. **Say:** Now that you have had time to think about it, we will review the answers.
5. Go over the correct answers with pupils and write them on the board. Show pupils how you converted the mixed numbers to improper fractions.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practice on your own. Just as before, copy the improper fractions in your exercise books and convert them to mixed numbers. You will have 7 minutes to work. When you finish with your work, please check your answers with a partner.
2. **Write** five examples on the board.

a. $\frac{47}{5}$ (Answer: $\frac{47}{5}=9\frac{2}{5}$)

b. $\frac{119}{11}$ (Answer: $\frac{119}{11}=10\frac{9}{11}$)

c. $\frac{40}{12}$ (Answer: $\frac{41}{12}=3\frac{5}{12}$)

d. $\frac{143}{10}$ (Answer: $\frac{143}{10}=14\frac{3}{10}$)

e. $\frac{50}{7}$ (Answer: $\frac{50}{7}=7\frac{1}{7}$)

3. As pupils are working, walk around and assist them as needed. Answer any questions if they arise. Once the seven minutes is up, call attention to the board and provide correct answers to pupils.

**Closing** *(2 minutes)*

1. **Ask**: What happens to the remainder in the division problem? Raise your hand to answer. (Answer: It becomes the numerator in the new fraction.)
2. **Say:** Great work today! Tomorrow we are going to learn how to convert from improper fractions to mixed numbers.

| **Lesson Title:** Expressing Fractions in their Lowest Form | **Theme:** Number and Numeration (Fractions) | |
|---|---|---|
| **Lesson Number:** M-06-075 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to express fractions in their lowest form. | **Teaching Aids**<br>None | **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to learn how to express fractions in lowest form. This means that we want to use the smallest numbers to represent the same amount. We will need to remember how to find equivalent fractions, but rather than multiplying to get an equivalent fraction, we will divide to find the equivalent fraction.
2. **Say:** If you remember, we used this method to help us determine if fractions were equivalent. Let's review this now.

**Introduction to the New Material** *(10 minutes)*

1. **Write** $\frac{12}{36}$ on the board.
2. **Say:** We know that both twelve and thirty-six are divisible by two. We can reduce this fraction by dividing both the numerator and the denominator by two. This will reduce our fraction.
3. Show pupils the division of both the numerator and denominator by two. $\frac{12\div2}{36\div2}=\frac{6}{18}$.
4. **Say:** By dividing both the numerator and the denominator by two, we have reduced our fraction. But, this fraction is not in its lowest form. We can divide the fraction again to make it smaller. In order to reduce a fraction to its lowest form, we must continue dividing the numerator and denominator by the same number until there are no more common factors. In this example, our fraction in lowest form is one-third.
5. **Write** the whole process on the board for pupils to see. $\frac{6\div6}{18\div6}=\frac{1}{3}$.
6. **Say:** It doesn't matter what number you divide the numerator and denominator by as long as it divides evenly into both numbers and is the same number on top and bottom. The key is to continue dividing until you can divide no more. You can divide by small numbers all the way through, or you can divide larger numbers if you can see them from the start.
7. **Say:** Remember, it is useful to know common factors that we learned earlier to determine what to divide by.

**Guided Practice** *(10 minutes)*

1. **Write** three fractions on the board:

a. $\frac{8}{12}$ (Answer: $\frac{2}{3}, \frac{8}{12} \div \frac{4}{4} = \frac{2}{3}$)

b. $\frac{3}{9}$ (Answer: $\frac{1}{3}, \frac{3}{9} \div \frac{3}{3} = \frac{1}{3}$)

c. $\frac{7}{12}$ (Answer: This is already in lowest form because there is no common number to divide the numerator and the denominator)

2. **Say:** In your exercise books, please copy the fractions. Then reduce the fractions until they are in their lowest form. Remember to continue dividing both the numerator and denominator by the same amount until you can no longer divide them.
3. Allow pupils to work for 7 minutes. Walk around the classroom and assist pupils as needed.
4. **Say:** Now that you have had time to think about it, we will review the answers.
5. Go over the correct answers with pupils and write them on the board. Show pupils how you converted the mixed numbers to improper fractions.
6. **Say:** Be careful with the last example because we are not able to divide seven and twelve by the same number, so we can say that it is already in the lowest form.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practice on your own. Just as before, copy the fractions in your exercise books and reduce them to their lowest form. You will have five minutes to work. When you finish with your work, please check your answers with a partner.
2. **Write** five examples on the board.

a. $\frac{6}{10}$ (Answer: $\frac{3}{5}, \frac{6}{10} \div \frac{2}{2} = \frac{3}{5}$)

b. $\frac{18}{36}$ (Answer: $\frac{1}{2}, \frac{18}{36} \div \frac{9}{9} = \frac{2}{4} \div \frac{2}{2} = \frac{1}{2}$)

c. $\frac{9}{12}$ (Answer: $\frac{3}{4}, \frac{9}{12} \div \frac{3}{3} = \frac{3}{4}$)

d. $\frac{5}{12}$ (Answer: This fraction is already in its lowest form.)

e. $\frac{50}{80}$ (Answer: $\frac{5}{8}, \frac{50}{80} \div \frac{10}{10} = \frac{5}{8}$)

3. As pupils are working, walk around and assist them as needed. Answer any questions that arise. Once the five minutes is up, call their attention to the board and have pupils raise their hands to offer their responses. Call on pupils for each question until the correct answer is provided.

**Closing** *(2 minutes)*

1. **Ask**: What can all even numbers be divided by? Raise your hand to answer. (Answer: 2)
2. **Ask**: How does knowing common factors help us? Raise your hand to answer. (Answer: We divide common factors in order to reduce fractions.)
3. **Say:** Great work today! During the next classes, we will learn how to manipulate fractions through addition, subtraction, multiplication and division.

| **Lesson Title:** Addition and Subtraction of Fractions | **Theme:** Everyday Arithmetic Fractions | |
|---|---|---|
| **Lesson Number:** M-06-076 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to add and subtract fractions with denominators up to 12. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to learn how to add and subtract fractions. In order to add and subtract fractions, we must have like fractions. We will have to use our skills in finding equivalent fractions to find common denominators before we will be able to add or subtract.

**Introduction to the New Material** *(10 minutes)*

1. **Write** $\frac{1}{2}$ and $\frac{1}{3}$ on the board.
2. **Say:** If we wanted to make these 2 fractions have the same denominator we would multiply them by the denominator of the other fraction. This is the easiest method to find a common denominator. However, this is not always the most efficient especially if the numbers are very large. We are looking at denominators up to 12 so we can use this method. We can also look at common multiples which we studied earlier this year.
3. **Write** $\frac{1\times3}{2\times3}=\frac{3}{6}$ and $\frac{1\times2}{3\times2}=\frac{2}{6}$ on the board to show pupils the math to get like fractions.
4. **Say:** As you can see, we now have fractions with the same denominator for both fractions. We are really combining the ideas of equivalent fractions and like fractions. Now if we wanted to add one half and one third, we have to find like fractions before we can add. Once we have changed our fractions to this form, we can add our numerators and keep our common denominator.
5. **Write** the solution on the board so pupils can see the process. $\frac{1}{2}+\frac{1}{3}=\frac{3}{6}+\frac{2}{6}=\frac{5}{6}$
6. **Say:** As you can see one half plus one third is equal to five sixths. We must follow the process to get like fractions each time we need to add or subtract fractions. We only add or subtract the numerators and keep the denominators.
7. **Write** $\frac{1}{3}-\frac{1}{4}$ on the board. Show pupils how you find the common denominator of 12 for each of these fractions and how you find the solution.
8. **Write**: $\frac{1x4}{3x4}=\frac{4}{12}$ and $\frac{1x3}{4x3}=\frac{3}{12}$
9. **Write**: $\frac{1}{3}-\frac{1}{4}=\frac{4}{12}-\frac{3}{12}=\frac{1}{12}$

10. **Say**: Remember, after you have like fractions, the process is as simple as 4 minus 3 to get one-twelfth.

**Guided Practice** *(10 minutes)*

1. **Write** 3 problems on the board.
   a. $\frac{4}{3}-\frac{2}{3}$ (Answer: $\frac{2}{3}$)
   b. $\frac{3}{9}+\frac{5}{9}$ (Answer: $\frac{8}{9}$)
   c. $\frac{1}{6}+\frac{7}{12}$ (Answer: $\frac{1x2}{6x2}+\frac{7}{12}=\frac{2}{12}+\frac{7}{12}=\frac{9}{12}=\frac{3}{4}$)
2. **Say:** In your exercise books, please copy the problems and solve them. Please reduce answers to get the final solution.
3. Pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to think about it, we will review the answers.
5. Go over the correct answers with pupils and write them on the board.
6. **Say:** Be careful with the last example because we have to reduce the final answer to lowest form.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Just as before, be sure to find like fractions and reduce final answers when applicable. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 5 examples on the board.
   a. $\frac{3}{10}+\frac{2}{5}$ (Answer: $\frac{3}{10}+\frac{2x2}{5x2}=\frac{3}{10}+\frac{4}{10}=\frac{7}{10}$)
   b. $\frac{4}{7}+\frac{2}{3}$ (Answer: $\frac{4x3}{7x3}+\frac{2x7}{3x7}=\frac{12}{21}+\frac{14}{21}=\frac{26}{21}=1\frac{5}{21}$)
   c. $\frac{9}{12}-\frac{3}{8}$ (Answer: $\frac{9x2}{12x2}-\frac{3x3}{8x3}=\frac{18}{24}-\frac{9}{24}=\frac{9}{24}=\frac{3}{8}$)
   d. $\frac{5}{6}-\frac{8}{12}$ (Answer: $\frac{5x2}{6x2}-\frac{8}{12}=\frac{10}{12}-\frac{8}{12}=\frac{2}{12}=\frac{1}{6}$)
   e. $\frac{5}{8}+\frac{5}{9}$ (Answer: $\frac{5x9}{8x9}+\frac{5x8}{9x8}=\frac{45}{72}+\frac{40}{72}=\frac{85}{72}=1\frac{13}{72}$)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils for each question until the correct answer is provided.

**Closing** *(2 minutes)*

1. **Say:** Great work today. For the next class, we will learn how to multiply fractions.

| **Lesson Title:** Multiplication of Fractions | **Theme:** Everyday Arithmetic Fractions | |
|---|---|---|
| **Lesson Number:** M-06-077 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to multiply fractions with denominators up to 12. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to learn how to multiply fractions. In some ways multiplying fractions is the easier operation on fractions. We don't have to find like denominators. We just cancel and multiply or multiply and reduce.

**Introduction to the New Material** *(10 minutes)*

1. **Write** $\frac{1}{2}\times\frac{1}{3}$ on the board.
2. **Say:** To multiply 2 fractions we multiply the numerators together and the denominators together. The answer is just the product of the numerators over the denominators. We do have to check if we can reduce our answer though. The example on the board tells us that one half times one third equals one sixth.
3. **Write** the solution $\frac{1}{2}\times\frac{1}{3}=\frac{1}{6}$ on the board.
4. **Say:** This is the most straightforward of multiplication of fractions that we have. There is no reduction of the answer. Let's try another example.
5. **Write** $\frac{3}{5}\times\frac{1}{6}$ on the board.
6. **Say:** In this problem, when we multiply we see that three fifths times one sixth equals three thirtieths. We can reduce three thirtieths to equal one tenth. That means that the final answer is one tenth.
7. Show the solution on the board, including the final answer. $\frac{3}{5}\times\frac{1}{6}=\frac{3}{30}\frac{\div 3}{\div 3}=\frac{1}{10}$
8. **Say:** In the last example we had to reduce our final answer. It is possible, however, to reduce before you multiply. If you see any numbers that can divide into both the numerator and the denominator of either fraction, you can reduce the fraction before multiplying. Let's see what this looks like.
9. **Write** a different solution on the board for the last example. $\frac{\overset{1}{\cancel{3}}}{5}\times\frac{1}{\underset{2}{\cancel{6}}}=\frac{1}{5}\times\frac{1}{2}=\frac{1}{10}$
10. **Say:** The only difference between the 2 processes is when we reduce our fractions. It is up to you when you want to reduce your fractions. If you reduce before you multiply, you will be multiplying smaller numbers. On the other hand, sometimes you may not see the best way to reduce before multiplying, so be sure to double check your answer for reduction options.

**Guided Practice** *(10 minutes)*

1. **Write** 3 problems on the board.
   a. $\frac{4}{3}\times\frac{2}{3}$ (Answer: $\frac{8}{9}$)
   b. $\frac{3}{9}\times\frac{9}{5}$ (Answer: $\frac{3}{5}$)
   c. $\frac{1}{6}\times\frac{7}{12}$ (Answer: $\frac{7}{72}$)
2. **Say:** In your exercise books, please copy the problems and solve them. Please reduce answers, if possible, to get the final solution.
3. Pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to think about it, we will review the answers.
5. Go over the correct answers with pupils and write them on the board.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Just as before, be sure to find like fractions and reduce final answers when applicable. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 5 examples on the board.
   a. $\frac{3}{10}\times\frac{2}{5}$ (Answer: $\frac{3}{25}$)
   b. $\frac{4}{3}\times\frac{9}{12}$ (Answer: $1$)
   c. $\frac{9}{12}\times\frac{3}{8}$ (Answer: $\frac{9}{32}$)
   d. $\frac{5}{6}\times\frac{8}{12}$ (Answer: $\frac{5}{9}$)
   e. $\frac{3}{7}\times\frac{5}{4}$ (Answer: $\frac{15}{28}$)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils for each question until the correct answer is provided.

**Closing** *(2 minutes)*

1. **Say:** Great work today. Next class we will learn how to divide fractions. In order to divide fractions we must be comfortable multiplying fractions.
2. **Ask:** Does anyone have any questions about the process for multiplying fractions?
3. Answer any questions that pupils may ask about the process for multiplying fractions.

| **Lesson Title:** Division of Fractions | **Theme:** Everyday Arithmetic Fractions | |
|---|---|---|
| **Lesson Number:** M-06-078 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to divide fractions with denominators up to 12. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to learn how to divide fractions. In many ways, division of fractions is very similar to multiplying fractions. If we remember from yesterday, in order to multiply fractions we have to multiply our numerators together and our denominators together and reduce the answer to simplest form. It is also possible to reduce the original problem to get smaller numbers before multiplying our fractions together. We need to remember these things as we move forward and divide fractions.

**Introduction to the New Material** *(10 minutes)*

1. **Write** $\frac{1}{2} \div \frac{1}{3}$ on the board.
2. **Say:** To divide 2 fractions we follow the phrase 'Keep, Change, Flip'. We keep the first fraction the same, we change the division sign to multiplication, and we flip the second fraction. When we do this, we end up with a multiplication of 2 fractions problem. Then we multiply fractions as we learned yesterday.
3. **Write** Keep, Change, Flip on the board under each fraction and operation to show how they correspond.
4. **Write** the solution to the first problem on the board: $\frac{1}{2} \div \frac{1}{3} = \frac{1}{2} \times \frac{3}{1} = \frac{3}{2}$
5. **Say:** We can see that the answer to one half divided by one third is equal to three halves. We still have to reduce after we change the division problem to a multiplication problem as we did last class. Let's try another example.
6. **Write** $\frac{2}{10} \div \frac{4}{5}$ on the board. Show pupils the solution. $\frac{2}{10} \div \frac{4}{5} = \frac{\overset{1}{\cancel{2}}}{\underset{2}{\cancel{10}}} \times \frac{\overset{1}{\cancel{5}}}{\underset{2}{\cancel{4}}} = \frac{1}{4}$. Explain to pupils that we cancel as much as possible before multiplying across. If we multiplied across first, we would get the same answer, but would have had to reduce ten fortieths. That would have reduced to one fourth as well.

**Guided Practice** *(10 minutes)*

1. **Write** 3 problems on the board.
   a. $\frac{4}{3} \div \frac{2}{3}$ (Answer: $2$)

b. $\frac{3}{9} \div \frac{9}{5}$ (Answer: $\frac{15}{81} = \frac{5}{27}$)

c. $\frac{1}{6} \div \frac{7}{12}$ (Answer: $\frac{2}{7}$)

2. **Say:** In your exercise books, please copy the problems and solve them. Please reduce answers, if possible, to get the final solution.
3. Pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to think about it, we will review the answers.
5. Go over the correct answers with pupils and write them on the board.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Just as before, be sure to find like fractions and reduce final answers when applicable. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 5 examples on the board.

a. $\frac{3}{10} \div \frac{2}{5}$ (Answer: $\frac{3}{4}$)

b. $\frac{4}{3} \div \frac{9}{12}$ (Answer: $\frac{16}{9}$)

c. $\frac{9}{12} \div \frac{3}{8}$ (Answer: $\frac{6}{3} = 2$)

d. $\frac{5}{6} \div \frac{8}{12}$ (Answer: $\frac{5}{4}$)

e. $\frac{3}{7} \div \frac{5}{4}$ (Answer: $\frac{12}{35}$)

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils for each question until the correct answer is provided.

**Closing** *(2 minutes)*

1. **Say:** Great work today. Next class we will learn how to combine all 4 operations and the order of operations to solve multistep problems with fractions.
2. **Ask:** Does anyone have any questions about the process for dividing fractions?
3. Answer any questions that pupils may ask about the process for dividing fractions.

| **Lesson Title:** Combining 2 or More Operations in Fractions | **Theme:** Everyday Arithmetic Fractions | |
|---|---|---|
| **Lesson Number:** M-06-079 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to solve simple fractions involving 2 or more operations. | **Teaching Aids**<br>None | **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to learn how to apply the order of operations to solve problems with fractions. We will see combinations of addition, subtraction, multiplication and division of fractions. Before we begin, we must remember the order of operations. We know that we first do multiplication and division from left to right and then we finish with addition and subtraction from left to right. If we solve our problem out of order, we will get an incorrect solution.
2. **Write** on the board:
    a. Multiplication and Division from Left to Right
    b. Addition and Subtraction from Left to Right

**Introduction to the New Material** *(10 minutes)*

1. **Write** $\frac{3}{4}+\frac{1}{6}\times\frac{2}{5}-\frac{1}{10}$ on the board.
2. **Say:** To solve this problem we first solve the multiplication. We then do the addition and finish with the subtraction. I will show you the steps on the board.
3. **Write** the solution step by step on the board for pupils to see what to do.
$$\frac{3}{4}+\frac{1}{6}\times\frac{2}{5}-\frac{1}{10}$$
$$\frac{3}{4}+\frac{1}{15}-\frac{1}{10}$$
$$\frac{49}{60}-\frac{1}{10}$$
$$\frac{43}{60}$$
4. Explain each step as you solve the problem. Remind pupils about finding the common denominator to add and subtract. The common denominator for 4 and 15 is 60 and the common denominator for 60 and 10 is 60.
5. **Say:** As you can see we solved this problem following the order of operations. We will do this for all multi-step problems.

**Guided Practice** *(10 minutes)*

1. **Write** 1 problem on the board.

2. **Say**: Remember, we must perform the operation inside the parenthesis first before you move to the operations on the outside.

a. $\frac{4}{3}-\left(\frac{2}{3}-\frac{1}{6}\right)\div\frac{3}{8}$ (Answer: $\frac{4}{3}-\left(\frac{2}{3}-\frac{1}{6}\right)\div\frac{3}{8}$ $\frac{4}{3}-\frac{1}{2}\div\frac{3}{8}$ $\frac{4}{3}-\frac{1}{2}\times\frac{8}{3}$ $\frac{4}{3}-\frac{4}{3}=0$ )

3. **Say:** In your exercise books, please copy the problem and solve it. Please reduce, if possible, to get the final solution.
4. Pupils work for 5 minutes. Walk around the room and assist pupils as needed.
5. **Say:** Now that you have had time to think about it, we will review the answer.
6. Go over the correct answer with pupils and write it on the board. Explain each step as you put it on the board.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Just as before, be sure to find like fractions and reduce final answers when applicable. Also remember to start inside the parenthesis and work your way out. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 2 examples on the board:

a. $\frac{3}{10}+\frac{1}{5}-\left(\frac{4}{3}\times\frac{3}{10}\right)$ (Answer: $\frac{3}{10}+\frac{1}{5}-\left(\frac{4}{3}\times\frac{3}{10}\right)$ $\frac{3}{10}+\frac{1}{5}-\frac{2}{5}$ $\frac{3}{10}+\frac{2}{10}-\frac{4}{10}=\frac{1}{10}$ )

b. $\frac{3}{11}\times\frac{3}{4}\div\left(\frac{5}{6}-\frac{1}{3}\right)$ (Answer: $\frac{3}{11}\times\frac{3}{4}\div\left(\frac{5}{6}-\frac{1}{3}\right)$ $\frac{3}{11}\times\frac{3}{4}\div\left(\frac{1}{2}\right)$ $\frac{9}{44}\div\frac{1}{2}$ $\frac{9}{44}\times\frac{2}{1}=\frac{9}{22}$ )

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their pupils.

**Closing** *(2 minutes)*

1. **Say:** Great work today. Next class we will work on word problems involving fractions.
2. **Ask:** Does anyone have any questions about the process of using the order of operations on fractions?
3. Answer any questions that pupils may ask about today's lesson.

| **Lesson Title:** Word Problems in Fractions Involving Multi-Step Problems | **Theme:** Everyday Arithmetic Fractions | |
|---|---|---|
| **Lesson Number:** M-06-080 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to solve problems in fractions including multi-step problems. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to use everything we have learned about fractions to solve word problems. We are now going to use the 4 operations together to solve real life problems but we need to remember the basic rules.
2. **Write** on the board:
    a. For addition and subtraction, you have to find like denominators using equivalent fractions.
    b. For multiplication, multiply the numerators together and the denominators together and reduce.
    c. For division, use the rule, 'keep, change, flip' and then multiply and reduce normally.

**Introduction to the New Material** *(10 minutes)*

1. **Write** a word problem on the board: Fatama is having a party. She has LE 200,000 to spend on it. She spends $\frac{1}{4}$ on food, $\frac{3}{8}$ on drinks, and $\frac{2}{10}$ on music. How much money does she have left to spend on decorations? (Answer: LE 35,000)
2. Read the word problem to the class.
3. **Say:** We have to think about what the problem is asking us for in order to solve it. We have been given fractional amounts of our budget to be spent on different items for the party. We can use those fractions to find out how much is spent on food, drinks and music. We can set up our problem solving process to add the 3 fractions together before multiplying them by LE 200,000.
4. **Write** the process on the board and explain it to pupils as you work through the solution.

$$\left(\frac{1}{4}+\frac{3}{8}+\frac{2}{10}\right)\times 200{,}000$$

$$\left(\frac{10}{40}+\frac{15}{40}+\frac{8}{40}\right)\times 200{,}000$$

$$\frac{33}{40}\times\frac{200{,}000}{1}$$

$$\frac{33}{1}\times\frac{5000}{1}=165{,}000$$

5. **Say:** This solution of LE 165,000 tells us that Fatama spent that amount on food, drinks and music. We now have to subtract LE 200,000 – LE 165,000 to find out how much Fatama has to spend on decorations. When we subtract, we see that Fatama has LE 35,000 left to spend on decorations.

**Guided Practice** *(10 minutes)*

1. **Write** another word problem on the board and have pupils copy this one in their exercise books:

   We asked 100 people who their favourite band was. $\frac{3}{5}$ of the people said they like P-Square.

   How many people voted for one of the other groups as their favourite band? (Answer: 40 people)
2. **Say:** Please copy this word problem in your exercise books as I read it to you.
3. Read the word problem to pupils as they copy it in their books.
4. **Say:** This problem is similar to the last one, but I want you to try the problem on your own.
5. Pupils will try the problem in their exercise books. Walk around the room and assist when needed. After 5 minutes call attention to the front of the board to show pupils the proper solution. Write and explain the solution on the front board. $\frac{3}{5}\times 100=\frac{3}{1}\times\frac{20}{1}=60$. Tell pupils that this shows us that 60 people voted for P-Square, but the question was asking how may people did not vote for P-Square, so we have to subtract. $100-60=40$. This means that 40 people did not vote for P-Square as their favourite band.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Just as before, write the problems in your exercise books and think about what the problem is looking for. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** an example on the board.

   a. You have 2 kg of rice at the beginning of the week. On Sunday you prepare $\frac{1}{8}$ of the rice, on Monday you prepare $\frac{1}{4}$ of the rice and on Tuesday you prepare $\frac{1}{3}$ of the rice. How much rice is remaining for Wednesday? (Answer: $\frac{7}{12}$ kg of rice remaining;

   $\left(\frac{1}{8}+\frac{1}{4}+\frac{1}{3}\right)\times 2$

   $\left(\frac{3}{24}+\frac{6}{24}+\frac{8}{24}\right)\times 2$ )

   $\frac{17}{24}\times 2=\frac{17}{12}$

   $2-\frac{17}{12}=\frac{24}{12}-\frac{17}{12}=\frac{7}{12}$

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their pupils.

**Closing** *(2 minutes)*

1. **Say:** Great work today. We will be moving on from fractions and working with geometry next week.
2. **Ask:** Does anyone have any questions about operations on fractions?
3. Answer any questions that pupils may ask about today's lesson.

| **Lesson Title:** Perimeter of Shapes | **Theme:** Geometry Perimeters and Areas | |
|---|---|---|
| **Lesson Number:** M-06-081 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

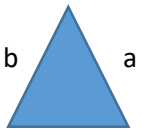
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Calculate the perimeter of triangles using a formula.<br>2. Calculate the perimeter of squares and rectangles using a formula. | **Teaching Aids**<br>None | **Preparation**<br>Draw the triangles, squares and rectangles for the problems in the lesson on the board. |
|---|---|---|

**Opening** *(2 minutes)*

1. **Say:** Today we are going to calculate the perimeter of triangles, squares and rectangles. The perimeter of a shape is the sum of the lengths of all the outer edges. Triangles, squares and rectangles are special shapes because the perimeter of each can be calculated by using a formula.

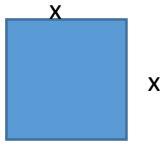
**Introduction to the New Material** *(13 minutes)*

1. Draw a triangle on the board and label each of the sides: a, b and c.




P = a + b + c

2. **Say:** Because perimeter is the sum of all the outer edges, to calculate the perimeter of this triangle, add up all the sides. The general formula to calculate the perimeter of any triangle is P equals a plus b plus c.
3. **Write** down the formula underneath the triangle: P = a + b + c. Draw another triangle on the board with each value: 7, 12 and 6. The placement of each number does not matter.
4. **Say:** We can name side 7 as a, side 12 as b and side 6 as c. If we substitute the numbers into the formula, we get P = 7 + 12 + 6.
5. **Write** down the equation as you say it.
6. **Ask:** What is the perimeter of the new triangle? (Answer: P = 25)
7. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.
8. Draw a square on the board. Label all the sides with the letter x.




P = x + x + x + x

9. **Say:** A square is a shape that has 4 equal sides and 4 right angles. The general formula to calculate the perimeter of any rectangle is P equals x plus x plus x plus x.
10. **Write** down the equation under the square: P = x + x + x + x.
11. **Ask:** How can we simplify this so that we do not add the same number 4 times? (Answer: P = 4x)
12. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them. Draw another square on the board. Label all the sides with the number 3.
13. **Say:** Because we have 4 equal sides, we can substitute the number 3 in for x because that is the length of each side.
14. **Write**: P = 4(3) or 4 x 3
15. **Ask:** What is the perimeter of the square? (Answer: P = 12)
16. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.
17. **Draw** a rectangle on the board. Label the left and right sides W and the top and bottom L.


18. **Say:** A rectangle is a 4-sided shape with 4 right angles. The short edges are the same size and are called the width. The long edges are the same size and called the length. The general formula to calculate the perimeter of any rectangle is P equals length plus width plus length plus width.
19. Write down the equation under the rectangle: P = l + w + l + w.
20. **Say:** We can simplify this to read P = 2l + 2w because we have 2 lengths and 2 widths.
21. Draw another rectangle on the board. Label the left and right sides 4 and the top and bottom sides 15.
22. **Say:** Because we have a rectangle, we can substitute in 15 for l, since that is the long edge and 4 for w since that is the short edge.
23. **Write**: P = 2(15) + 2(4)
24. **Ask:** How can we simplify this and then calculate the perimeter of the rectangle? (Answer: $P = 30 + 8 = 38$)
25. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

**Guided Practice** *(8 minutes)*

1. **Draw** the following on the board and write P = ? under each figure:
    a. A triangle with the side lengths 8 m, 8 m and 13 m (Answer: P = 29 m)
    b. A square where all 4 sides are a length of 10 cm (Answer: P = 40 cm)
    c. A rectangle with a length of 11 m and a width of 6 m (Answer: P = 34 m)
2. **Say:** Please copy these problems in your exercise books. These problems have measurements but are still similar to the others. I want you to try them on your own. For each figure, calculate the perimeter of each figure and make sure to include the units in your answer.

3. Pupils will try the problems in their exercise books. Walk around the room and assist when needed. After 4 minutes call attention to the front of the board to show pupils the proper solutions.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Just as before, write the problems in your exercise books and calculate the perimeter of each figure. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Draw** an example of each example on the board:
    a. Triangle with side lengths of 12, 13, 14 (Answer: P = 12 + 13 + 14; P = 39)
    b. Triangle with side lengths of 15 cm, 8 cm, 9 cm (Answer: P = 15 + 8 + 9; P = 32 cm)
    c. Square with side length of 7 (Answer: P = 4(7); P = 28)
    d. Square with side length of 4 km (Answer: P = 4(4); P = 16 km)
    e. Rectangle with length of 10 and width of 5 (Answer: P = 2(10) + 2(5); P = 20 + 10; P = 30)
    f. Rectangle with length of 8 m and width of 1 m (Answer: P = 2(8) + 2(1); P = 16 + 2; P = 18 m)
3. As pupils are working, walk around and assist as needed. Make sure to take note if pupils are including units of measurement in answers for problems b, d and f. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We will be using the concepts of perimeter in the next lesson on irregular shapes.
2. **Ask:** Does anyone have any questions about calculating the perimeter of triangles, squares and rectangles?
3. Answer any questions that pupils may ask about the process for calculating the perimeter.

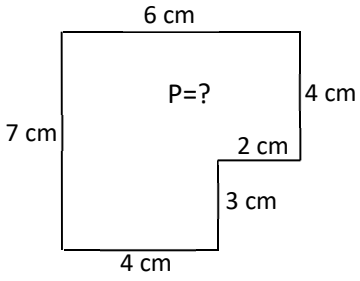
| | | |
|---|---|---|
| **Lesson Title:** Finding the Perimeter of Irregular Shapes | **Theme:** Geometry Perimeters and Areas | |
| **Lesson Number:** M-06-082 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to calculate the perimeter of irregular shapes. | **Teaching Aids**<br>None | **Preparation**<br>Draw the irregular shapes from the lesson on the board. |

**Opening** *(3 minutes)*

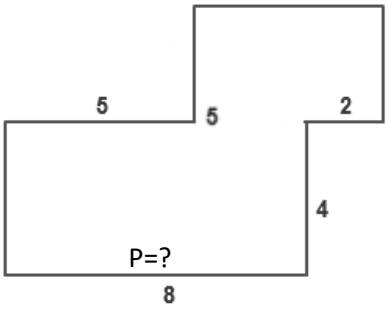
1. **Say:** Today we are going to calculate the perimeter of irregular shapes. An irregular shape cannot be defined like a triangle, square or rectangle. The sides of an irregular shape will not all be the same length, although some of them can be.
2. **Ask**: How does one calculate the perimeter of any shape?
   (Answer: add up the lengths of all the outer edges)
3. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

**Introduction to the New Material** *(5 minutes)*

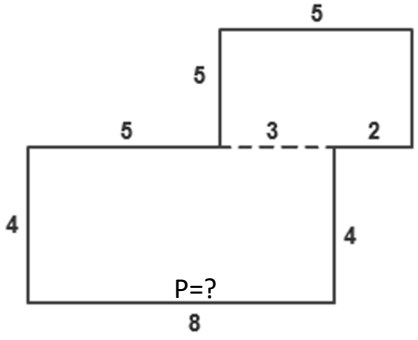



1. **Say:** Because the term 'irregular shape' can be for almost any shape, there is no formula for it. Instead, we just add up all the sides.
2. Draw the first image that is on the right on the board.
3. **Say:** We can calculate the perimeter of this shape by adding up all the sides.
4. Write down the equation as you say it:
   P = 6 + 4 + 2 + 3 + 4 + 7
5. **Ask:** What is the perimeter of the new shape? (Answer: P = 26 cm)
6. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

**Guided Practice** *(10 minutes)*




1. Draw the second image that is on the right on the board.
2. **Say:** Please copy this image in your exercise books. Sometimes, we are not given the lengths of all the sides that we need to calculate the perimeter.
3. **Ask**: Can anyone say how we can determine the other side lengths that are missing?
   (Answer: look at the information and measurements we do have.)
4. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct



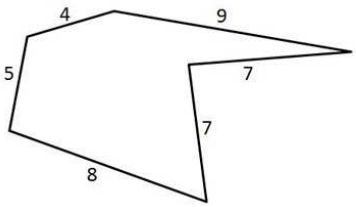
answer, explain it to them. Draw out the partitions and explain where the other values come from.

5. **Say:** There are 2 rectangles that are formed. Because the bottom part of the irregular figure is 8, the space between the length of 5 and 2 in the middle of the irregular figure is 3.
   In the bottom rectangle, the left side is the same length as the right side.
   In the top rectangle, the right side is the same length as the left side. The bottom of the top rectangle is 3 + 2, or 5, so the top of the rectangle is also 5. You will now have 3 minutes to calculate the perimeter of this irregular figure.
6. Pupils will calculate the perimeter in their exercise books. Walk around the room and assist when needed. You might have to remind pupils that perimeter is only the outer edges of a figure, and the value of 3 is not used in the calculation. After 3 minutes call attention to the front of the board to show pupils the proper solution.
   P = 4 + 5 + 3 + 5 + 3 + 2 + 4 + 8 (Answer: P = 34)

**Independent Practice** *(14 minutes)*

1. **Say:** Now you will practise on your own. Just as before, draw the figures in your exercise books and calculate the perimeter of each figure. You will have 8 minutes to work. When you finish with your work, check your answers with a partner.
2. **Draw** each of the images on the board for the pupils to copy:

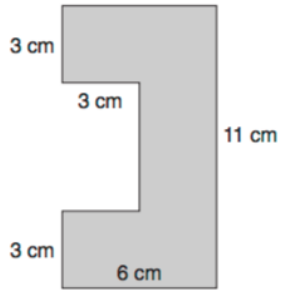
   a.




   P = ?

   a. (Answer: P = 40) P = 5 + 4 + 9 + 7 + 7 + 8

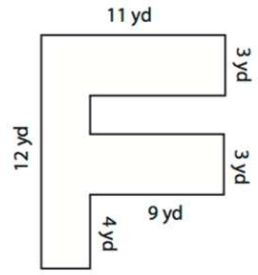
   b.




   P = ?

   b. (Answer: P = 40 cm)
   The top unknown is 6 cm.
   The bottom unknown is 3 cm.
   The shorter vertical part is 5 cm, since 3 + 5 + 3 = 11 cm
   P = 3 + 6 + 11 + 6 + 3 + 3 + 5 + 3

c.




P = ?

c. (Answer: P = 64 yds)
The bottom unknown is 2 yds since 2 + 9 = 11
The 2 horizontal lines are 9 yd
The vertical line is 2 yds since 3 + 2 + 3 + 4 = 12
P = 11 + 3 + 9 + 2 + 9 + 3 + 9 + 4 + 2 + 12

3. As pupils are working, walk around and assist as needed. Have pupils draw out rectangles within the irregular shapes for b and c if needed. Answer questions if they arise. Once 8 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(3 minutes)*

1. **Say:** Sometimes the irregular shapes are tricky, and you have to draw in other shapes like rectangles or squares. That is something we will do more of when we look at the area of these figures.
2. **Ask:** Does anyone have any questions about calculating the perimeter of irregular shapes?
3. Answer any questions that pupils may ask about the process for calculating the perimeter.

| **Lesson Title:** Area of Squares and Rectangles | **Theme:** Geometry Perimeters and Areas | |
|---|---|---|
| **Lesson Number:** M-06-083 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

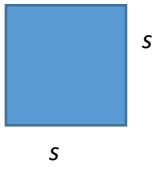
| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Calculate the area of a square using the formula.<br>2. Calculate the area of a rectangle using the formula. | **Teaching Aids**<br>None | **Preparation**<br>Draw the shapes for the introduction, guided practice and independent practice in the lesson on the board. |

**Opening** *(5 minutes)*

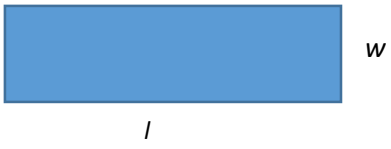
1. **Say:** Today we are going to calculate the area of a square and rectangle using area formulas.
2. **Ask**: What is different about a square and rectangle? (Answer: A square has 4 sides of equal length, and a rectangle has 4 sides where opposite sides have equal lengths.)
3. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them. Accept other answers that correctly describe differences, but have the main focus be on the side lengths.
4. **Ask**: What does the area of a shape relate to?
   (Answer: the amount of space inside of that shape)
5. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

**Introduction to the New Material** *(5 minutes)*

1. **Say:** Even though squares and rectangles are very similar, their area formulas are different because their side lengths are different.
2. Draw a square on the board and label 1 of the sides and either the top or bottom with an ‘s’.




3. **Say:** We can calculate the area of a square by looking at how much space is inside. The equation to calculate the area of a square is ‘s’ times ‘s’.
4. **Write** down the equation as you say it:
   $A = s \times s$
5. **Draw** a rectangle on the board and label the long side with an *l* and the shorter side with a *w.*



6. **Say:** We can calculate the area of a rectangle by looking at how much space is inside. The amount of space is inside. Like with a square, the space runs along the length of the rectangle and then along with width of the rectangle. The equation to calculate the area of a rectangle is L times W.
7. **Write** down the equation as you say it: $A = l \times w$

**Guided Practice** *(10 minutes)*

1. **Say:** No matter what shape we look at, the measurements are always in 'square units'. This is because there are 2 sides involved in the calculation. We write this as unit$^2$.
2. **Draw** a square on the board and label the bottom 5 m and 1 of the sides 5 m. **Write** A = ? underneath the image.
3. **Say:** Please copy this image in your exercise books. In order to calculate the area of this square, we substitute the side lengths into the equation.
4. **Write** down the equation as you say it: $A = 5 \times 5$
5. **Say:** Because the answer will be in square units, the answer is 25 meters squared.
6. **Write** down $A = 25$ m$^2$ as you say the answer.
7. **Draw** a rectangle on the board with a width of 7 cm and a length of 9 cm. **Write** A = ? underneath the image.
8. **Say:** Please copy this image in your exercise books.
9. **Ask:** Can anyone determine how to calculate the area of this rectangle and what the answer would be? Raise your hand to answer. (Answer: $A = 9 \times 7$; $A = 63$ cm$^2$)
10. **Say:** Please copy these images in your exercise books. You will have 3 minutes to calculate the area of each figure.
    a. Draw a square on the board and label 2 of the sides 11 km. (Answer: $A = 121$ km$^2$)
    b. Draw a rectangle on the board and label the length as 12 km and the width as 11 km. (Answer: $A = 132$ km$^2$)
11. Pupils will calculate the area in their exercise books. Walk around the room and assist when needed. You might have to remind pupils that with area, units are squared. After 3 minutes call attention to the front of the board to show pupils the proper solution.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Just as before, draw the figures in your exercise books and calculate the area of each figure. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Draw** each of the images on the board for the pupils to copy:
    a. A square with side lengths of 15 m (Answer: $A = 15 \times 15$; $A = 225$ m$^2$)
    b. A square with side lengths of 6 km (Answer: $A = 6 \times 6$; $A = 36$ km$^2$)
    c. A rectangle with width 10 mm and length 14 mm (Answer: $A = 14 \times 10$; $A = 140$ mm$^2$)
    d. A rectangle with length 20 cm and width 13 cm (Answer: $A = 20 \times 13$; $A = 260$ cm$^2$)

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once 5 minutes is up, call attention to the board and have pupils raise their hands to offer their

responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(5 minutes)*

1. **Say:** The area of squares and rectangles will be used in the next lessons. Knowing that area units are squared is important.
2. **Ask:** Does anyone have any questions about calculating the area of squares and rectangles?
3. Answer any questions that pupils may ask about the process for calculating the area.

| **Lesson Title:** Area of Triangles | **Theme:** Geometry Perimeters and Areas | |
|---|---|---|
| **Lesson Number:** M-06-084 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

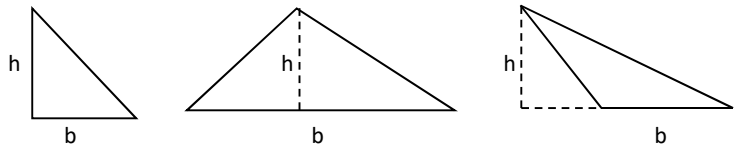
| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to calculate the area of a triangle using the formula. | **Teaching Aids**<br>None | **Preparation**<br>Draw the triangles for the lesson on the board. |

**Opening** *(2 minutes)*

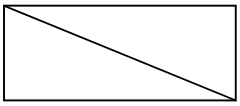
1. **Say:** Today we are going to calculate the area of a triangle using a formula. The area of a triangle is the amount of space inside a triangle.
2. **Ask:** If the measurements of a triangle are in meters, what would the area unit be?
   (Answer: meters squared)
3. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

**Introduction to the New Material** *(8 minutes)*

1. **Say:** In a triangle, we can call 1 of the sides the base of the triangle. In all triangles, there is a line that forms a right angle with the base. Sometimes that line is 1 of the sides of the triangle and sometimes it has to be drawn in. This line is called the height of the triangle.
2. **Draw** the following images on the board. Draw in right angle boxes where the base and the height meet and label the h and b. Point out the three types of heights and bases.



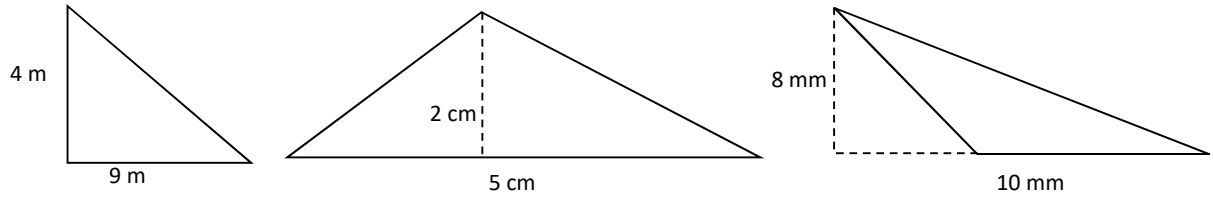

3. **Say:** Please copy these images in your exercise books. They are different examples of how a problem might be given to you. The b stands for base and the h stands for height. Dashed lines are not part of the perimeter of a triangle.
4. **Say:** The area of a triangle is based on the area of a rectangle.
5. Draw a rectangle on the board.
6. **Ask:** How can we create 2 triangles from this rectangle?
   (Answer: See image on right.)



7. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses and have them draw it on the board. If none of the pupils give the correct answer, draw it out for them.
8. **Say:** Because 2 triangles make up a rectangle, the area of a triangle is half that of a rectangle. Another way to say this is that the area is the base times the height, divided by 2.
9. **Write** down the equation as you say it: $A = \frac{bh}{2}$

**Guided Practice** *(10 minutes)*

1. **Draw** the following images on the board. Write A = ? under each image:




2. **Say:** Please copy the images in your exercise books. In order to calculate the area of each triangle, we substitute the base and height of each into the equation.
3. **Write** down each equation as you say it out loud:

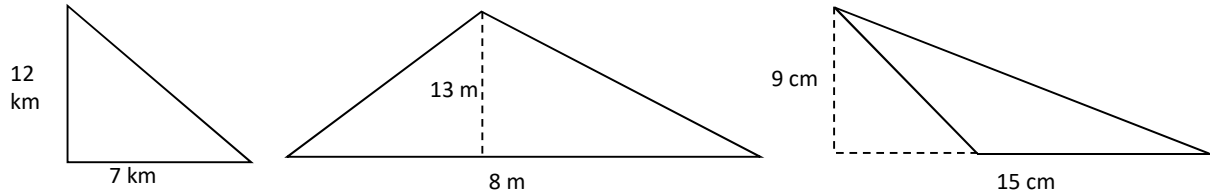
   $A = \frac{(9)(4)}{2}$ $A = \frac{(5)(2)}{2}$ $A = \frac{(10)(8)}{2}$
4. **Say:** You will have 3 minutes to fully calculate the area of each figure. Remember to include the units in your answers.
5. Pupils will calculate the area in their exercise books. Walk around the room and assist when needed. After 3 minutes call attention to the front of the board to show pupils the proper solutions.

   $A = \frac{36}{2}$ $A = \frac{10}{2}$ $A = \frac{80}{2}$

   (Answers: A = 18 $m^2$ A = 5 $cm^2$ A = 40 $mm^2$)

**Independent Practice** *(12 minutes)*

1. **Say:** Now you will practise on your own. Just as before, draw the figures in your exercise books and calculate the area of each figure. You will have 6 minutes to work. When you finish with your work, check your answers with a partner.
2. **Draw** each of the images on the board for the pupils to copy. Write A = ? under each image:




3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their peers.

   $A = \frac{(7)(12)}{2}$ $A = \frac{(8)(13)}{2}$ $A = \frac{(15)(9)}{2}$

   $A = \frac{84}{2}$ $A = \frac{104}{2}$ $A = \frac{135}{2}$

   (Answers: A = 42 $km^2$ A = 52 $m^2$ A = 67.5 $cm^2$)

**Closing** *(3 minutes)*

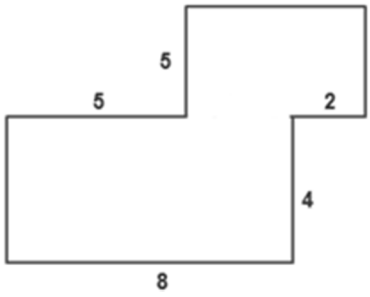
1. **Say:** The last problem had a decimal in the answer, which can happen when calculating area for any figure, not just triangles. In the next lesson, we will be using all of the area formulas to calculate the area of irregular shapes.
2. **Ask:** Does anyone have any questions about calculating the area of triangles?
3. Answer any questions that pupils may ask about the process for calculating the area.

| **Lesson Title:** Area of Composite Shapes | **Theme:** Geometry Perimeters and Areas | |
|---|---|---|
| **Lesson Number:** M-06-085 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to calculate the area of a composite shape. | **Teaching Aids**<br>None | **Preparation**<br>Draw the shapes for the lesson on the board. |

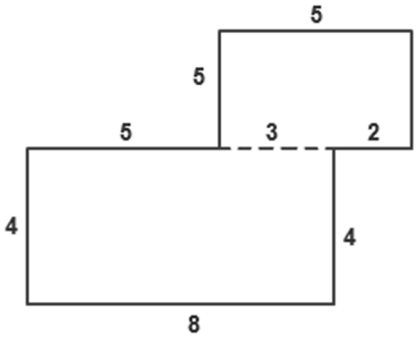
**Opening** *(2 minutes)*

1. **Say:** Today we are going to calculate the area of composite shapes. We have called composite shapes irregular shapes in the past. We will be using the area formulas from squares, rectangles and triangles to calculate the area of composite shapes.
2. **Draw** the image on the right on the board.
3. **Ask:** What was important when working with irregular shapes like the one that is drawn?
   (Answer: break it down into more recognisable shapes)
4. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

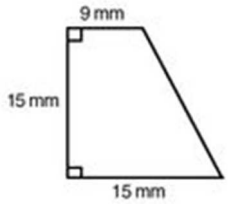



**Introduction to the New Material** *(10 minutes)*

1. **Say:** As we did with irregular shapes, we will have to break down composite shapes into ones that are more recognisable. The ones we are working with will be able to be broken down into squares, rectangles and triangles.
2. Call on a pupil to go to the board to break down the image into 2 rectangles and to fill in the unknown sides. (Answer: See right image.)
3. **Ask:** What is the area of each of the drawn rectangles?
   (Answer: Top: A = 3×5 = 15; Bottom: A = 8×4 = 32)
4. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, show them how to approach the problem. You might need to label each smaller figure as 1 and 2 or A and B.
5. **Say:** Now that we have the area of each separate figure, we can calculate the area of the total figure by adding our answers together.
6. **Write** the answer on the board while saying it: A = 15 + 32; A = 47
7. Draw the following figures on the board. Write down A = ? under each image:



a.

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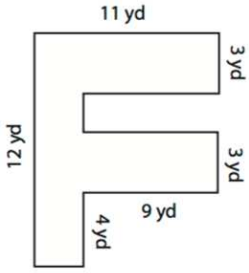
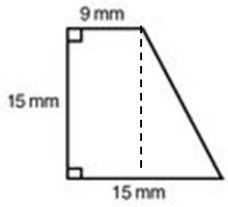
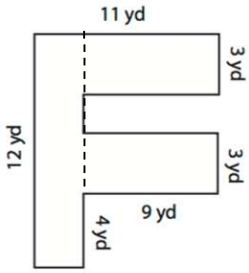



8. **Say:** Please copy these images in your exercise books.
9. **Ask:** How can we break down each image into ones we know how to work with?
   (Answer: One way of doing this is seen below. Keep in mind that pupils might break them down in a different way):

a.




b.




10. Have pupils raise their hands to offer their answers. Call on 2 or 3 pupils for their responses and have 2 different pupils draw their answers on the board. If none of the pupils give the correct answer, draw out the above answers for them.

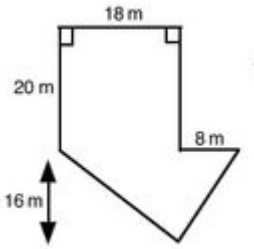
**Guided Practice** *(10 minutes)*

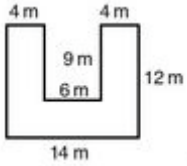
1. **Say:** Use the images we just split up to calculate the total area of each composite shape. You will be given 5 minutes to do this. **Write** A = ? under each image.
2. Pupils will calculate the area in their exercise books. Walk around the room and assist when needed. You might need to remind pupils to add the total areas together. After 5 minutes call attention to the front of the board to show pupils the proper solutions.
   a. Left: A = 15×9; A = 135 $mm^2$
      Right: A = $\frac{(6)(15)}{2}$; A = $\frac{90}{2}$; A = 45 $mm^2$
      135 + 45 (Answer: A = 180 $mm^2$)
   b. Left: A = 12×2; A = 24 $yd^2$
      Top: A = 9×3; A =18 $yd^2$
      Bottom: A = 9×3; A = 18 $yd^2$
      24 + 18 + 18 (Answer: A = 60 $yd^2$)

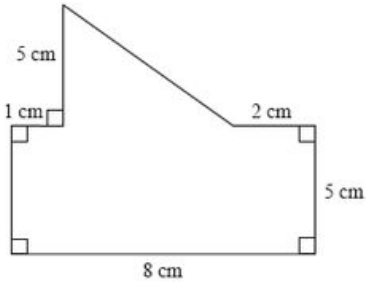
**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Just as before, draw the figures in your exercise books and calculate the area of each composite figure. You will have 6 minutes to work. When you finish with your work, check your answers with a partner.
2. Draw each of the images on the board for the pupils to copy. Write A = ? under each image:

a. b. c.

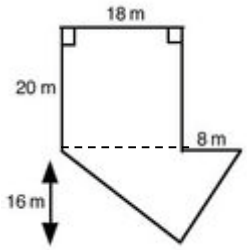


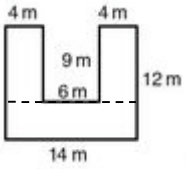

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their peers.
   Possible splits are shown below. Final answers to the areas will be the same no matter how pupils split the image.

   a.



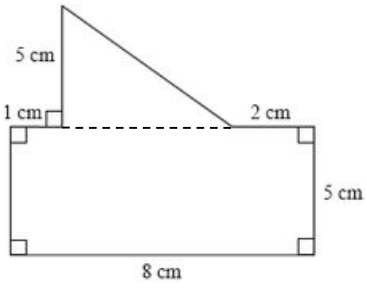

   a. Rectangle: A =20×18 = 360 $m^2$
   Triangle: A = $\frac{(26)(16)}{2}$; A = $\frac{416}{2}$; A = 208 $m^2$
   360 + 208 (Answer: A = 568 $m^2$)

   b.




   b. Left: A =9×4; A = 36 $m^2$
   Right: A =9×4; A = 36 $m^2$
   Bottom: 14×3; A = 42 $m^2$
   36 + 36 + 42 (Answer: A = 114 $m^2$)

   c.




   c. Rectangle: A =8×5; A = 40 $cm^2$
   Triangle: A = $\frac{(5)(5)}{2}$; A = $\frac{25}{2}$; A = 12.5 $cm^2$
   40 + 12.5 (Answer: A = 52.5 $cm^2$)

   d.

**Closing** *(3 minutes)*

1. **Say:** Being able to recognise when and how to break down a figure is very important. In the next lesson, we will be doing arithmetic again. You will learn how to write equivalent fractions, which also requires you to recognise how to break down fractions.
2. **Ask:** Does anyone have any questions about calculating the area of composite shapes?
3. Answer any questions that pupils may ask about the process for calculating the area.

| **Lesson Title:** Fractions with Denominators of 10 or 100 (Revision) | **Theme:** Everyday Arithmetic: Decimals and Fractions | |
|---|---|---|
| **Lesson Number:** M-06-086 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to write equivalent fractions with 10 or 100 as denominators. | **Teaching Aids**<br>None | **Preparation**<br>None |
|---|---|---|

**Opening** *(3 minutes)*

1. **Say:** Today we are going to go back to working with fractions. We will focus on finding fractions with denominators of 10 and 100. We will eventually use these ideas to relate fractions to decimals and place value. In order to practise the skill today, it is important to remember how to find equivalent fractions. We know that to find equivalent fractions we must multiply or divide both the numerator and denominator by the same number.

**Introduction to the New Material** *(10 minutes)*

1. **Write** $\frac{2}{5}$ on the board.
2. **Say:** Today we want to find equivalent fractions that result in the denominator being 10 or 100. To do this we have to think about what we need to multiply the given denominator by to result in 10 or 100. In the example of two fifths, we know we can multiply 5 by 2 to get 10. This means that we can multiply the both the numerator and denominator by 2 to get an equivalent fraction with a denominator of 10.
3. Show the work on the board: $\frac{2\times2}{5\times2}=\frac{4}{10}$
4. **Say:** This means that $\frac{2}{5}$ is equivalent to $\frac{4}{10}$ if we are looking for a denominator of 10. We can follow the same logic to find an equivalent fraction with a denominator of 100.
5. **Ask:** What do we multiply by 5 to get 100? Raise your hand to answer. (Answer: 20)
6. **Say:** Yes, we can multiply 5 by 20 to get 100. Therefore, to find an equivalent fraction for $\frac{2}{5}$ with a denominator of 100, we must multiply both the numerator and denominator by 20.
7. Show the work on the board. $\frac{2\times20}{5\times20}=\frac{40}{100}$

**Guided Practice** *(10 minutes)*

1. **Write** 3 examples on the board:
   a. $\frac{1}{2}$ (Answer: $\frac{5}{10}$; $\frac{50}{100}$)

b. $\frac{3}{5}$ (Answer: $\frac{6}{10}$; $\frac{60}{100}$)

c. $\frac{3}{4}$ (Answer: cannot write with a denominator of 10; $\frac{75}{100}$)

2. **Say:** Please copy these 3 examples into your exercise books. Find equivalent fractions for each of the examples with a denominator of 10 and a denominator of 100. Please make a note if you cannot find an equivalent fraction with one of the denominators.
3. Have pupils work for 6 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will review the answers.
5. Go over the answers with pupils and how to find them. Be sure to show pupils that since 4 does not divide into 10, we cannot find an equivalent fraction with a denominator of 10 for the last example.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 5 examples on the board.

   a. $\frac{4}{5}$ (Answer: $\frac{8}{10}$; $\frac{80}{100}$)

   b. $\frac{3}{5}$ (Answer: $\frac{6}{10}$; $\frac{60}{100}$)

   c. $\frac{1}{4}$ (Answer: cannot write with a denominator of 10; $\frac{25}{100}$)

   d. $\frac{2}{4}$ (Answer: $\frac{5}{10}$; $\frac{50}{100}$)

   e. 3 (Answer: $\frac{30}{10}$; $\frac{300}{100}$)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their pupils.
4. **Say:** The last 2 questions are particularly more challenging. We can write $\frac{2}{4}$ with a denominator of 10 because two fourths equals one half. We can then find the equivalent fractions from there. The last example was a whole number. We can always write whole numbers as fractions with a denominator of 1. When we find equivalent fractions for whole numbers, we always have improper fractions.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will be finding equivalent fractions with denominators of 1000. We will use the same skills that we used today to find equivalent fractions with denominators of 10 and 1000.
2. **Ask:** Does anyone have any questions about the skills we learned today? Answer any questions.

| **Lesson Title:** Fractions with Denominators of 1000 | **Theme:** Everyday Arithmetic: Decimals and Fractions | |
|---|---|---|
| **Lesson Number:** M-06-087 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to write equivalent fractions with 1000 as a denominator. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to continue finding equivalent fractions, but today we will focus on finding them with denominators of 1000. Tomorrow we will see why these denominators are so important in understanding the relationship between fractions, decimals and percentages, but today we first must become comfortable with the process.

**Introduction to the New Material** *(10 minutes)*

1. **Write** $\frac{2}{5}$ on the board.
2. **Say:** Today we are going to start with the same example that we did yesterday. We already know that $\frac{2}{5}=\frac{4}{10}=\frac{40}{100}$, but we need to think about how we can get a denominator of 1000.
3. **Ask:** Does anyone know what we multiply by 5 to get 1000? Raise your hand to answer. (Answer: 200; 5 x200 = 1000)
4. **Say:** Since we now know that we must multiply the denominator by 200 to get the desired denominator, we can find the equivalent fraction with a denominator of 1000. We will multiply both the numerator and the denominator by 200 for our answer.
5. **Write** the solution on the board and explain each step to pupils as you do so. $\frac{2\times200}{5\times200}=\frac{400}{1000}$
6. **Say:** We say that 'two fifths' is equal to 'four hundred thousandths'.

**Guided Practice** *(10 minutes)*

1. **Write** 3 examples on the board.
   a. $\frac{1}{2}$ (Answer: multiply by 500; $\frac{500}{1000}$)
   b. $\frac{3}{5}$ (Answer: multiply by 200; $\frac{600}{1000}$)
   c. $\frac{3}{4}$ (Answer: multiply by 250; $\frac{750}{1000}$)

2. **Say:** Please copy these 3 examples into your exercise books. Find equivalent fractions for each of the examples with a denominator of 1000. Make a note if you cannot find an equivalent fraction with one of the denominators.
3. Have pupils work for 6 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will review the answers.
5. Go over the answers with pupils and how to find them. Be sure to write out the multiplication for pupils to see the process.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 5 examples on the board.
    a. $\frac{4}{5}$ (Answer: multiply by 200; $\frac{800}{1000}$)
    b. $\frac{1}{4}$ (Answer: multiply by 250; $\frac{250}{1000}$)
    c. $\frac{2}{8}$ (Answer: multiply by 125; $\frac{250}{1000}$)
    d. $\frac{5}{8}$ (Answer: multiply by 125; $\frac{625}{1000}$)
    e. $\frac{7}{20}$ (Answer: multiply by 50; $\frac{350}{1000}$)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will use our skills at finding equivalent fractions with powers of 10 as our denominators to convert between fractions and decimals and vice versa.
2. **Ask:** Does anyone have any questions about the skills we learned today?
3. Answer any questions that pupils may ask about today's lesson.

| **Lesson Title:** Fractions as Decimals and Vice Versa | **Theme:** Everyday Arithmetic: Decimals and Fractions | |
|---|---|---|
| **Lesson Number:** M-06-088 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to write fractions with denominators of 10, 100 and 1000 as decimals and vice versa. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to build on the skills we learned over the past few days of finding equivalent fractions with denominators of 10, 100 and 1000. We will write fractions with these denominators as decimals. We will also learn how to write decimals as fractions with these types of denominators.
2. **Say:** We know that place value relies on powers of 10. When we learned decimal place value, we learned that the first decimal place is called the 'tenths place'; the second decimal place is called the 'hundredths place'; and the third is called the 'thousandths place'. The names of these places correspond to our fractions with denominators of 10, 100 and 1000. We will see how this works today.
3. **Write:**
    a. tenths place is $\frac{x}{10}$
    b. hundredths place is $\frac{x}{100}$
    c. thousandths place is $\frac{x}{1000}$

**Introduction to the New Material** *(10 minutes)*

1. **Write** $\frac{13}{100}$ on the board.
2. **Say:** If we wanted to write this fraction as a decimal, we can think about what the name of the fraction is. We read this fraction as 'thirteen hundredths'. We can then write this same number as a decimal with the same name.
3. **Write** 0.13 on the board.
4. **Say:** The decimal is equal to the fraction, and it is easy to convert because we have decimal place equivalents to our fractions with powers of 10 in the denominator. When we convert, we can write the decimal with the ones digit in the numerator on that place value related to the denominator. In our first example, we write the 3 in the hundredths place because our denominator was 100 and the 3 was in the ones place of the numerator. From there we just fill in the rest of the places. This is true for other powers of 10 as well.
5. **Write** $\frac{13}{10} = 1.3$ and $\frac{13}{1000} = 0.013$ on the board.

6. **Say:** We can write these 2 fractions as decimals just as easily. We see that the 3 is in the respective place value, and we write the 1 to the left. If there are gaps in our place values we fill them in with zeros. It is also important to note that when we have an improper fraction, our ones place has a digit other than zero. We can use this same logic to convert from decimals to fractions. We know the place value names. These tell us what our denominator will be and we can write the rest of the number in the numerator. I will write 3 decimals with their fractional equivalents on the board.
7. **Write** $9.7 = \frac{97}{10}$, $0.97 = \frac{97}{100}$, and $0.097 = \frac{97}{1000}$ on the board. Show pupils how we can go the other direction from decimals to fractions paying particular attention to where our decimal ends and how that corresponds to the denominator of our fraction.

**Guided Practice** *(10 minutes)*

1. **Write** 4 examples on the board.
    a. $0.853$ (Answer: $\frac{853}{1000}$)
    b. $\frac{352}{100}$ (Answer: $3.52$)
    c. $0.03$ (Answer: $\frac{3}{100}$)
    d. $\frac{17}{1000}$ (Answer: $0.017$)
2. **Say:** Please copy these 4 examples into your exercise books. Please convert from fraction to decimal or from decimal to fraction for each problem.
3. Have pupils work for 6 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will review the answers.
5. Go over the answers with pupils and how to find them. Be sure to emphasise the relationship between place value and denominators for each example.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner. You may have to find equivalent fractions with powers of 10 denominators before you can write the fractions as decimals.
2. **Write** 5 examples on the board.
    a. $\frac{4}{5}$ (Answer: $0.8$)
    b. $2.37$ (Answer: $\frac{237}{100}$)
    c. $\frac{7}{8}$ (Answer: $0.875$)

d. $9.001$ (Answer: $\frac{9001}{1000}$)

e. $\frac{7}{20}$ (Answer: 0.35)

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will be learning how to order fractions and decimals when the numbers are given to us in different forms.
2. **Ask:** Does anyone have any questions about the skills we learned today?
3. Answer any questions that pupils may ask about today's lesson.

| **Lesson Title:** Ordering Fractions and Decimals | **Theme:** Everyday Arithmetic: Decimals and Fractions | |
|---|---|---|
| **Lesson Number:** M-06-089 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to order decimals and fractions, including mixed number fractions. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to learn how to order fractions and decimals at the same time. It is easiest to do this if we think of all our numbers with the same place value. We could also convert all our numbers to either decimals or fractions with the same denominator to order them most easily.
2. **Say:** In order to be successful, we need to remember how to convert between fractions and decimals and vice versa. If we have fractions with a power of 10 in the denominator we know exactly what our decimal is because of place value names tenths, hundredths and thousandths.

**Introduction to the New Material** *(10 minutes)*

1. **Write** $0.24, \frac{13}{100}, 0.031, \frac{5}{10}$ on the board.
2. **Say:** If we want to order these numbers from least to greatest, we have to think about how big the numbers are. It is easiest to put them in order if they are all written as decimals or as fractions with the same denominator. We will do both methods to see that we can get the same answer. First let's change everything to fractions with a denominator of 1000. We are changing to thousands because we can see from the numbers, the 0.031 is in thousandths and we can change the remaining ones easily.
3. Convert each number to a fraction with a denominator of 1000.

$0.24 = \frac{240}{1000}$ $\qquad$ $0.031 = \frac{31}{1000}$

$\frac{13}{100} = \frac{130}{1000}$ $\qquad$ $\frac{5}{10} = \frac{500}{1000}$

4. **Write** the numbers on the board as fractions with a denominator of 1000. Now show pupils that we can compare the numerators to order the numbers. Write the final order on the board.

$$\frac{31}{1000}, \frac{130}{1000}, \frac{240}{1000}, \frac{500}{1000} = 0.031, \frac{13}{100}, 0.24, \frac{5}{10}$$

5. **Say:** Now we can try to convert everything to decimals to see if we get the same answer.
6. Convert each number to decimals.

$0.24 = 0.240$

$\frac{13}{100} = 0.130$ $\frac{5}{10} = 0.500$

$0.031$

7. Write the numbers on the board as decimals to the thousandths place. Now show pupils that we can compare the decimals to order the numbers. Write the final order on the board.

$$0.031, 0.130, 0.24, 0.500 = 0.031, \frac{13}{100}, 0.24, \frac{5}{10}$$

8. **Say:** As you can see, both methods give us the same order of our numbers. You can choose either method going forward.

**Guided Practice** *(10 minutes)*

1. **Write** 3 examples on the board.
   a. 0.91, $\frac{5}{8}$, 0.78, $\frac{1}{2}$ (Answer: $\frac{1}{2}$, $\frac{5}{8}$, 0.78, 0.91)
   b. $\frac{1}{5}$, 0.1, 0.75, $\frac{3}{8}$ (Answer: 0.1, $\frac{1}{5}$, $\frac{3}{8}$, 0.75)
   c. 0.56, 0.01, $\frac{1}{2}$, 0.89 (Answer: 0.01, $\frac{1}{2}$, 0.56, 0.89)
2. **Say:** Please copy these 3 examples into your exercise books. Order the numbers from least to greatest. You can choose whether you want to convert to fractions or decimals in order to find your solution.
3. Have pupils work for 6 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will review the answers.
5. Go over the answers with pupils and how to find them. Be sure to how you know the order of each either by finding the decimals or common denominators of the fractions.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner. You may have to find equivalent fractions with powers of 10 denominators before you can write the fractions as decimals.
2. **Write** 5 examples on the board.
   a. $\frac{3}{4}$, 0.4, $\frac{3}{100}$, 0.005 (Answer: 0.005, $\frac{3}{100}$, 0.4, $\frac{3}{4}$)
   b. $2\frac{7}{8}$, 2.51, $2\frac{1}{4}$ (Answer: $2\frac{1}{4}$, 2.51, $2\frac{7}{8}$)
   c. 8.67, 8.57, $8\frac{2}{5}$, $8\frac{16}{20}$ (Answer: $8\frac{2}{5}$, 8.57, 8.67, $8\frac{16}{20}$)

d. 4.65, $4\frac{21}{40}$, 4.9, $4\frac{17}{20}$ (Answer: $4\frac{21}{40}$, 4.65, $4\frac{17}{20}$, 4.9)

e. $6\frac{1}{2}$, 6.8, $6\frac{2}{5}$, $6\frac{7}{10}$ (Answer: $6\frac{2}{5}$, $6\frac{1}{2}$, $6\frac{7}{10}$, 6.8)

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue working with fractions and decimals. We will calculate equivalence between fractions and decimals.
2. **Ask:** Does anyone have any questions about the skills we learned today?
3. Answer any questions that pupils may ask about today's lesson.

| **Lesson Title:** Equivalence Between Fractions and Decimals | **Theme:** Everyday Arithmetic: Decimals and Fractions | |
|---|---|---|
| **Lesson Number:** M-06-090 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to calculate equivalence between fractions and decimals. |  **Teaching Aids** None |  **Preparation** Draw the table for the introduction on the board. |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to practise finding equivalence between fractions and decimals. We have been doing this to solve many of the problems we have been working on so far this year. It is similar to converting between fractions and decimals. There are some regular equivalences that we use all the time that are important to memorise.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** We have been changing fractions to decimals and vice versa using long division for the past few weeks. While this is an effective way to determine whether we have the same quantities, it is much easier to know some common fraction and decimal equivalences. These fractions and decimals are frequently used and have easy to remember equivalences.
2. Create a table on the board and write common equivalences. Have pupils copy the table into their exercise books.

| Decimals | Fractions |
|---|---|
| 0.1 | $\frac{1}{10}$ |
| 0.2 | $\frac{1}{5}$ |
| 0.3 | $\frac{3}{10}$ |
| 0.4 | $\frac{2}{5}$ |
| 0.5 | $\frac{1}{2}$ |
| 0.6 | $\frac{3}{5}$ |
| 0.7 | $\frac{7}{10}$ |
| 0.8 | $\frac{4}{5}$ |
| 0.9 | $\frac{9}{10}$ |
| 0.25 | $\frac{1}{4}$ |
| 0.75 | $\frac{3}{4}$ |

3. **Say:** This table has some of the most common fraction and decimal equivalences. It will help if you learn these so you don't have to convert mathematically every time. Take your time to copy these into your exercise books. As you can see, all of these fractions are in lowest form. They cannot be reduced any further.

**Guided Practice** *(10 minutes)*

1. **Say:** Since we have to learn these, work in pairs to practise the numbers. One partner will use their exercise book to read a decimal. The other partner should write the number read as a fraction. The first partner will confirm whether the response is correct. Once each decimal has been read partners will switch roles. This time, the reading partner will read the fraction and the other partner will write the number as a decimal. Partners will help each other if there are difficulties.
2. Walk around the room and assist pupils as needed. Help pupils with saying the fractions or decimals as needed.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner. You may not use the table to get the answers. You are expected to write all the answers from memory.
2. **Write** numbers on the board:
    a. 0.3 (Answer: $\frac{3}{10}$)
    b. $\frac{4}{5}$ (Answer: 0.8)
    c. 0.7 (Answer: $\frac{7}{10}$)
    d. $\frac{1}{10}$ (Answer: 0.1)
    e. 0.75 (Answer: $\frac{3}{4}$)
    f. $\frac{9}{10}$ (Answer: 0.9)
    g. 0.6 (Answer: $\frac{6}{10}$)
    h. $\frac{1}{5}$ (Answer: 0.2)
    i. 0.4 (Answer: $\frac{2}{5}$)
    j. $\frac{1}{4}$ (Answer: 0.25)

k. 0.5 (Answer: $\frac{1}{2}$)

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Keep practising and memorising these equivalences.
2. **Say:** Good job today! You found how to determine equivalences between common fractions and decimals.

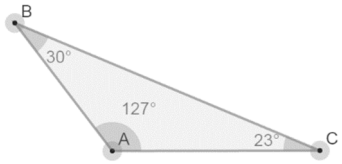
| **Lesson Title:** Properties of Right-Angled Triangles | **Theme:** Geometry Triangles | |
|---|---|---|
| **Lesson Number:** M-06-091 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Draw a right-angled triangle correctly.<br>2. Identify the properties of right-angled triangles. | **Teaching Aids**<br>None | **Preparation**<br>Draw the triangles from the lesson on the board. Be as accurate as you can. |
|---|---|---|

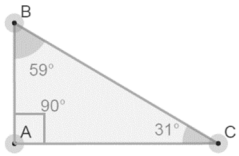
**Opening** *(2 minutes)*

1. **Say:** Today we are going to discuss right triangles and their properties.
2. Draw the following images on the board:

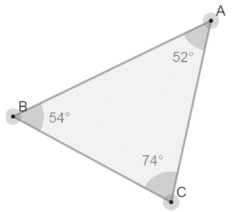
a.




b.




c.




3. **Say:** Please copy these images in your exercise book. All of these images are triangles, but only one of them is a right triangle.

**Introduction to the New Material** *(7 minutes)*

1. **Ask:** Which of the images on the board do you think is a right triangle, and why?
   (Answer: b because it has a square in angle A. A square in an angle shows that it is a right angle or exactly 90n degrees.)
2. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.
3. **Say:** There are 3 types of angles that a triangle can have and they are all measured in degrees. An acute angle is less than 90 degrees. A right angle is exactly 90 degrees and can be shown with a box in the corner. An obtuse angle is greater than 90 degrees. I will label each of the angles. Please write down the labels in your books.
4. Label each of the angles of the triangles from the opening accordingly while saying them out loud:

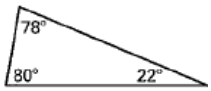
   a. Angle A is obtuse
   Angle B is acute
   Angle C is acute

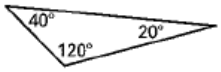
   b. Angle A is right
   Angle B is acute
   Angle C is acute

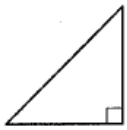
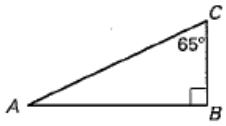
   c. Angle A is acute
   Angle B is acute
   Angle C is acute

5. **Say:** The sum of the interior angles of all triangles is 180 degrees. In the first triangle, 127 plus 30 plus 23 equals 180; in the second triangle, 90 plus 59 plus 31 equals 180; in the third triangle, 52 plus 54 plus 74 equals 180.
6. **Ask**: Why can't a right triangle have an obtuse angle? (Answer: A right angle is 90 degrees and an obtuse angle is more than 90 degrees. This would cause the sum to be more than 180 degrees.)
7. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.
8. Draw a right triangle on the board. Make sure to draw the box in the right corner. Write $72^{o}$ in another angle. Label that angle A, the right angle B and the other angle C.
9. **Say:** Please copy these images in your exercise book.
10. **Ask:** How can we calculate the measure of angle C? (Answer: $180 - 90 - 72 = 18^{o}$)
11. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct answer, explain it to them and work out the calculations.

**Guided Practice** *(10 minutes)*

1. **Draw** the following images on the board.
   a. 

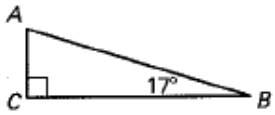
   b. 

   c. 
2. **Say:** Please copy these images in your exercise book. For each, answer the question: 'Is this triangle a right triangle? Why or why not?' You will have 2 minutes to do this.
3. Pupils will write their answers in their exercise books. After 2 minutes call attention to the front of the board to explain the answers.
   a. It is not, because there are all acute angles.
   b. It is not, because there is an obtuse angle.
   c. It is, because there is an angle with a box.
4. **Draw** and write the following on the board:
   a. 

   b. Draw a right triangle where one of the angles measures $17^{o}$ (the other is right so is 90 degrees). Calculate and write in the measure of the third angle.
5. **Say:** Please copy these problems in your exercise book. For the first, calculate the measure of the unknown angle, A. For the second, draw the image that is required. You will have 5 minutes to do this.
6. Pupils will write their answers in their exercise books. After 5 minutes call attention to the front of the board to explain the answers.

a. 180 – 90 – 65
(Answer: 25°)

b.

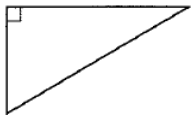



180 – 90 – 17
(Answer: 73°)

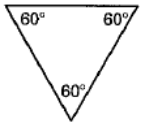
**Independent Practice** *(13 minutes)*

1. Draw and write the following on the board:

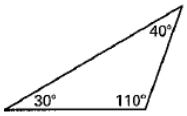
a.



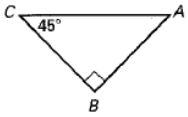
b.



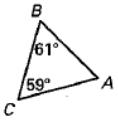

c.




d.




e.




f. Draw a right triangle where 1 of the angles measures 43°. Calculate and write in the measure of the third angle.

2. **Say:** Now you will practise on your own. Draw the figures in your exercise books. For the first 3, explain if each triangle is a right triangle and why. For d and e calculate the measure of the unknown angle, A. For f, draw the image that is described and find the missing angle. You will have 8 minutes to work. When you finish with your work, check your answers with a partner.
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. For letter e, pupils might need to be reminded that the interior angles of any triangle – not just right triangles – add up to 180 degrees. Once 8 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their peers.

a. A right triangle because of the box in a corner.

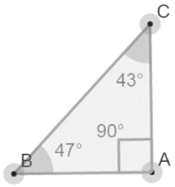
b. Not a right triangle because there are only acute angles.

c. Not a right triangle because there is an obtuse angle.

d. 180 – 90 – 45
(Answer: 45°)

e. 180 – 61 – 59
(Answer: 60°)

f. The third angle must be 47°. The triangle might look like:



**Closing** *(3 minutes)*

1. **Say:** We will continue to classify and analyse triangles in the next 4 lessons. Knowing that all triangles have interior angles that add to 180 degrees is very important for those lessons.
2. **Ask:** Does anyone have any questions about the properties of right triangles?
3. Answer any questions that pupils may ask about the properties of right triangles.

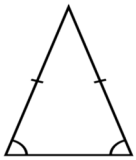
| **Lesson Title:** Properties of Isosceles Triangles | **Theme:** Geometry Triangles | |
|---|---|---|
| **Lesson Number:** M-06-092 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Draw an isosceles triangle correctly.<br>2. Identify the properties of isosceles triangles. | **Teaching Aids**<br>None | **Preparation**<br>Draw the images for the lesson on the board. |

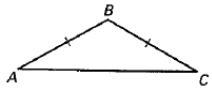
**Opening** *(2 minutes)*

1. **Say:** Today we are going to discuss isosceles triangles and their properties.
2. **Ask:** What is the sum of the interior angles of any triangle? (Answer: 180 degrees)
3. **Ask:** If there is an obtuse angle in a triangle, can it be right?
   (Answer: No, the sum will go over 180 degrees)
4. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

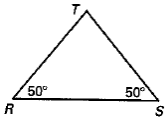
**Introduction to the New Material** *(7 minutes)*



1. **Draw** the image on the right on the board as you speak.
2. **Say:** An isosceles triangle is a triangle where 2 of the sides are of equal length and 2 of the angles have the same degree measure. The little marks on the sides show that they are of equal length. The little arches at the angles show that they have the same degree measure.
3. **Say:** The 2 sides that are equal length are called the legs of the triangle. They must each touch the 2 equal angles and then meet at a common angle. The angles that are equal are not shared by the legs. These angles are called the base angles.
4. **Draw** the following triangle on the board:




5. **Say:** Sides AB and BC are of equal length. This makes triangle ABC an isosceles triangle. That means angles A and C are of equal degree. Angles A and C are the base angles.
6. **Draw** the arches in angles A and C.
7. **Draw** the following triangle on the board:



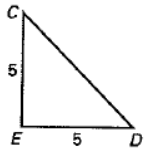

8. **Say:** Angles R and S have the same angle measure of 50 degrees. Because they are the same measure, triangle RST is an isoceles triangle. That means sides RT and ST are of equal measure and they are the legs of the triangle.
9. **Draw** the marks on sides RT and ST.
10. **Ask:** What is the measure of angle T? (Answer: 180 – 50 – 50 = 80$^{o}$)

11. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

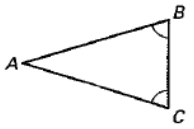
**Guided Practice** *(10 minutes)*

1. **Draw** the following images on the board.

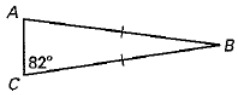
a.




b.

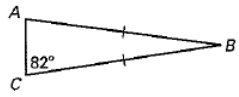



c.

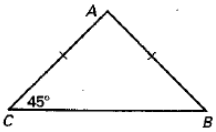



2. **Say:** Please copy these images in your exercise book. For each, first say why the triangle is isosceles. Then explain the equal sides and the equal angles.
3. Pupils will write their answers in their exercise books. After 2 minutes call attention to the front of the board to explain the answers.
   a. It is isosceles because sides CE and DE are of equal length. The base angles of the same degree measure are angles C and D.
   b. It is isosceles because angles B and C are the same degree measure. The legs that are the same length are sides AB and AC.
   c. It is isosceles because sides AB and CB are of equal length. The base angles of the same degree measure are angles A and C.
4. **Draw** and **write** the following on the board:

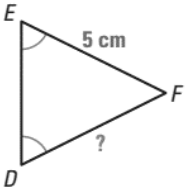
a.




b.

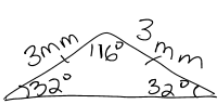



c.




d. Draw an isosceles triangle with base angles of 32° and legs with a length of 3mm. Calculate the measure of the third angle and write it in.

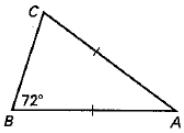
5. **Say:** Please copy these problems in your exercise book. For letters a and b, calculate the measures of all the other angles. For letter c, determine the length of side DF. For letter d, draw the required triangle.
6. Pupils will write their answers in their exercise books. After 5 minutes call attention to the front of the board to explain the answers.
   a. Angle A: 82°
      Angle B: 180 – 82 – 82
      (Answer: 16°)
   b. Angle B: 45°
      Angle A: 180 – 45 – 45
      (Answer: 90°)
   c. Side DF is 5 cm.
   d. The measure of the third angle is 180 – 32 – 32 = 116°. One possible drawing is on the left.



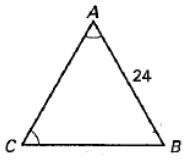
7. **Say:** As you can see, isosceles triangles can have a right angle or an obtuse angle. The most important thing about the angles that determine an isosceles triangle is that 2 of the angles are the same measure.

**Independent Practice** *(13 minutes)*

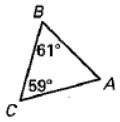
1. Draw and write the following on the board:
   a. Calculate the measures of all the angles.



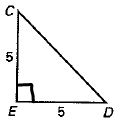

   b. Determine the length of the legs.




   c. Calculate the measure of angle A.




   d. Calculate the measures of angles C and D




   e. Draw an obtuse isosceles triangle where the obtuse angle is 110° with legs of length 4.2 cm. Then calculate the measures of the other angles.

   f. Draw a right isosceles triangle with legs of length 7 m. Then calculate the measures of the other angles.

2. **Say:** Now you will practise on your own. Draw the figures in your exercise books. For the first 4, determine if each triangle is an isosceles triangle. If it is, explain which sides are the legs of the triangle and which angles are the base angles. Then fully solve the problem. For e and f, draw the image that is described. You will have 8 minutes to work. When you finish with your work, check your answers with a partner.
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Pupils might need help on d and f: if the other 2 angles are the same measure and have to add up to 90, they are each 45°. Once 8 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their peers.
   a. (Answer: It is isosceles because AB and AC are the same length. Those are the legs. The base angles are B and C.
   Angle C: 72°
   Angle A:
   180 – 72 – 72 = 36°)

   b. (Answer: It is isosceles because angles A and C are the same measure. They are the base angles. The legs are AB and CB. The length of the legs is 24.)

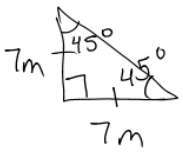
   c. (Answer: This is not an isosceles triangle because the measure of angle A is
   180 – 61 – 69 = 60°.
   None of the angles are the same measure meaning none of the sides are the same measure.)

d. (Answer: It is isosceles because EC and ED are the same length. Those are the legs. The base angles are C and D. They each measure 45° because
180 – 90 = 90 and
90 ÷ 2 = 45.)

e. (Answer: To calculate the measure of the other angles: 180 – 110 = 70. 70 ÷ 2 = 35.
It might look like:


)

f. (Answer: To calculate the measure of the other angles: 180 – 90 = 70. 90 ÷ 2 = 45

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**Closing** *(3 minutes)*

1. **Say:** It is important to remember the rules of isosceles triangles. These rules allow us to do other things in geometry in the future. We will be working with similar rules in the next lesson.
2. **Ask:** Does anyone have any questions about the properties of isosceles triangles?
3. Answer any questions that pupils may ask about the properties of isosceles triangles.

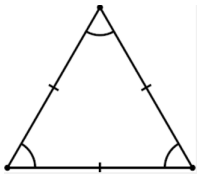
| **Lesson Title:** Properties of Equilateral Triangles | **Theme:** Geometry Triangles | |
|---|---|---|
| **Lesson Number:** M-06-093 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| **Learning Outcomes** | **Teaching Aids** | **Preparation** |
|---|---|---|
| By the end of the lesson, pupils will be able to:<br>1. Draw an equilateral triangle correctly.<br>2. Identify the properties of equilateral triangles. | Ruler | Draw the triangles from the lesson on the board. |

**Opening** *(5 minutes)*

1. **Say:** Today we are going to discuss equilateral triangles and their properties. The word equilateral has the word equal in it.
2. **Ask:** What does it mean for 2 things to be equal? (Example answers: They are exactly the same; they have exactly the same measurements; their angles and sides are the same)
3. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.
4. **Ask:** How do we show that sides of a triangle are of equal length?
   (Answer: by putting marks on the sides) How do we show that angles in a triangle have the same degree measure? (Answer: by putting arches at the angles)
5. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

**Introduction to the New Material** *(7 minutes)*



1. **Draw** the image on the right on the board as you speak.
2. **Say:** An equilateral triangle is a triangle where all 3 of the sides are of equal length and all 3 of the angles have the same degree measure.
3. **Ask**: What is the sum of the measure of the angles of any triangle? (Answer: $180^{o}$)
4. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.
5. **Say:** Because the sum of the measures of the angles of a triangle is 180 degrees, and because all the angles of an equilateral triangle are the same measurement, the measure of each angle of an equilateral triangle is 180 divided by 3 or 60 degrees each. No matter what the side lengths are, every angle is 60 degrees.
6. **Draw** triangle ABC on the board with a mark on every side. Make side AB 9 cm.
7. **Say:** The fact that every side has a mark on it tells us that this triangle is equilateral. That means that side BC is 9 cm and side AC is 9 cm. It also means that angles A, B and C are all 60 degrees.
8. **Write** the information on your triangle as you say it.
9. Draw triangle XYZ on the board with an arch on each angle. Make side YZ 6.5 mm.
10. **Say:** The fact that every angle has an arch tells us that this triangle is equilateral. That means that side XY is 6.5 mm and side XZ is 6.5 mm, and also that angles X, Y and Z are all 60 degrees.

11. Write the information on your triangle as you say it.

**Guided Practice** *(10 minutes)*

1. **Draw** the following images on the board:

    a. Triangle ABC with a mark on sides AB and BC. All angles have an arch.

    b. Triangle XYZ with an arch on angle X and a mark on all sides.

    c. Triangle RST with a mark on sides RS and RT and an arch on angles S and T.

2. **Say:** Please copy these images in your exercise books. Determine if each triangle is equilateral and explain why.
3. Pupils will write their answers in their exercise books. After 3 minutes call attention to the front of the board to explain the answers.

    a. (Answer: It is equilateral because all angles have an arch. That means all the sides are equal.)

    b. (Answer: It is equilateral because all sides have a mark. That means all angles have the same measure.)

    c. (Answer: It is not equilateral because only 2 sides have a mark and only 2 angles have an arch. This is an isosceles triangle.)

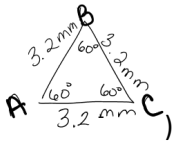
4. **Write** the following on the board:

    a. Draw an equilateral triangle named ABC where you know AB is 3.2 mm. Label all the other sides and all the angles with the correct measurements.

    b. Draw an equilateral triangle named GHI where you know IG is 12 cm. Label all the other sides and all the angles with the correct measurements.

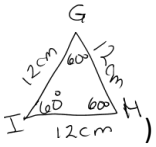
5. **Say:** Please draw these images in your exercise book.
6. Pupils will draw the images in their exercise books. After 3 minutes call attention to the front of the board to draw the triangles.

    a. (Answer:




    )

    b. (Answer:



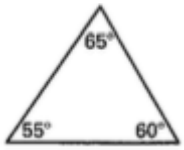

    )

7. **Say:** Now you will do some problems on your own.

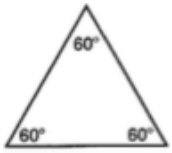
**Independent Practice** *(10 minutes)*

1. **Draw** and write the following on the board:

a. Explain if the triangle is equilateral or not.

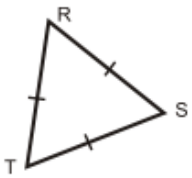



b. Explain if the triangle is equilateral or not.

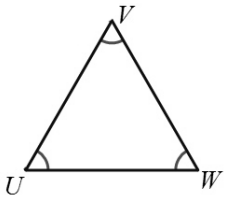



c. Explain if the triangle is equilateral or not.

d. Side RS has a length of 18 cm. Label all the other sides and all the angles with the correct measurements.




e. Side VU has a length of 9.2 mm. Label all the other sides and all the angles with the correct measurements.




f. Draw an equilateral triangle named ABC where you know BA is 2 mm. Label all the other sides and all the angles with the correct measurement.

2. **Say:** Draw the figures and directions in your exercise books. When you finish with your work, check your answers with a partner.
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once 8 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work to their peers.

a. (Answer: It is not equilateral because not all angles are 60°.)

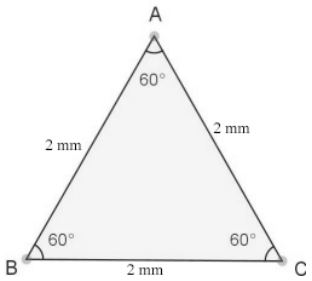
b. (Answer: It is equilateral because all angles are 60°.)

c. (Answer: It is not equilateral because 1 of the angles is 90°.)

d. (Answer: Sides RT and ST should be labelled 18 cm. Every angle should be labelled 60°.)

e. (Answer: Sides VW and UW should be labelled 9.2 mm. Every angle should be labelled 60°.)

f. (Answer: The image may look something like this:



**Closing** *(3 minutes)*

1. **Say:** Equilateral triangles have similarities to isosceles triangles. We will be comparing the 2 triangles in a future lesson so remember their similarities and differences.
2. **Ask:** Does anyone have any questions about the properties of equilateral triangles?
3. Answer any questions that pupils may ask about the properties of equilateral triangles.

| **Lesson Title:** Comparing Right-Angled Triangles and Isosceles Triangles | **Theme:** Geometry Triangles | |
|---|---|---|
| **Lesson Number:** M-06-094 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to compare a right-angled triangle and an isosceles triangle. |  **Teaching Aids** 1. Ruler 2. Protractor |  **Preparation** Copy rulers and protractors for pupils to share if none are available. |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to go more in depth on right triangles and isosceles triangles.
2. **Ask:** How can we determine if a triangle is a right triangle?
   (Answer: It has a right angle that is known by a box in 1 of the corners of the triangle.)
3. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.
4. **Ask:** How can we determine if a triangle is isosceles?
   (Answer: if 2 of the sides are the same length and if 2 of the base angles are the same measure)
5. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.

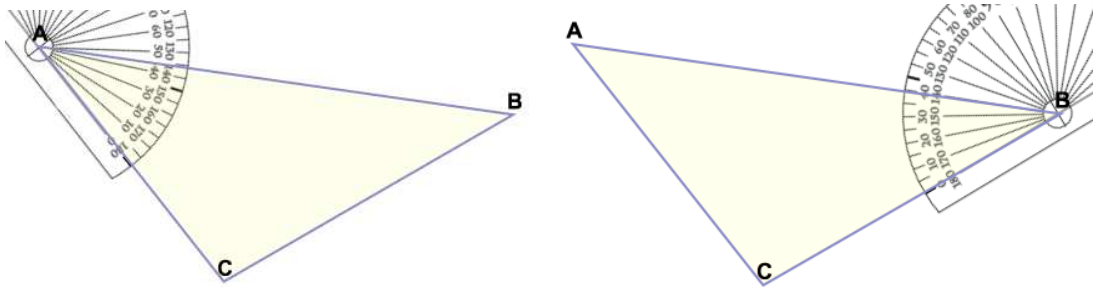
**Introduction to the New Material** *(7 minutes)*

1. **Say:** Use your ruler to draw a triangle in your exercise book with side lengths of 3 cm, 4 cm and 5 cm. Try to do this without creating a right angle. Label the angle that connects sides 3 and 4 A, the one that connects sides 4 and 5 B, and the one that connects sides 3 and 5 C.
2. **Ask:** It is possible to draw a triangle with side lengths of 3, 4 and 4 without making it a right triangle? If it is a right triangle, which angle is the right angle?
   (Answer: No, it is not. The right angle is angle A.)
3. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, give the answer. You can explain that the right angle in a right triangle is always opposite the longest side.
4. **Say:** Use your ruler to draw a triangle in your exercise book with 2 legs that are 7 cm. Then measure the third side length and write it down.
5. **Ask:** Is it possible to draw a triangle with 2 side lengths that are 7 cm without making it a right triangle? (Answer: Yes, it is.)
6. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, give the answer. Have pupils provide answers for the length of the third side. If a pupil drew a right triangle, then their third side length should be 9.9 cm.
7. **Say**: An isosceles right triangle with legs of length 7 must have the third side length of 9.9. Other isosceles triangles with legs of length 7 can have any other third side length.

**Guided Practice** *(13 minutes)*

1. **Say**: I will now show you how to use a protractor to measure the degree angles of your triangle.
2. **Draw** a triangle on the board. Put the middle part of your protractor on the angle you want to measure. If you are reading from right to left, use the inner number of the protractor. If you read from left to right, use the outer number of the protractor. As you measure the angles, verbalise what you are doing.

   Example: the measure of angle A is about 45°. I am reading from right to left and using the inside numbers. The measure of angle B is 40°. I am reading from left to right and using the outside numbers.




3. **Say**: After measuring 2 angles, you can calculate the measure of the third angle by subtracting the 2 values from 180.
   (In my example, angle C is 180 – 40 – 45 = 95°)
4. **Ask:** What are the measures of the angles of the first right triangle that we drew?
   (Answer: Angle B is about 37° and angle C is about 53°.)
5. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, show again how to use the protractor and determine the angle measures.
6. **Say**: For the right isosceles triangle where the leg lengths are 7 cm, the 2 base angles must be the same measure. In this case, they are each 45 degrees.
7. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, give the answer
8. **Draw** an isosceles triangle with legs lengths of 7 cm and the non-base angle anything other than 90°. Use the protractor to measure that angle.
9. **Ask:** How can we calculate the measures of the other 2 angles without a protractor?
   (Answer: Take 180 minus the measured angle then divide that number by 2.)
10. Have pupils raise their hands to offer their answer. Call on 2-3 pupils for their responses. If none of the pupils give the correct answer, give the correct answer for the example you provided.

**Independent Practice** *(10 minutes)*

1. **Say:** You will do some work on your own now. Draw the requested triangles and answer the questions. You have 6 minutes to work.
2. **Write** the following on the board:

a. Draw right triangle ABC where angle C is the right angle. Make CA 12 cm and CB 5 cm. Use your ruler to measure the length of side AB. Use your protractor to measure angle A. Then calculate the measure of angle B.
(Answer: Side AB: 13 cm. Measure of angle A: Between 22$^{o}$ and 23$^{o}$. Measure of angle B: Between 67 and 68$^{o}$.)
b. Draw triangle XYZ where XY and XZ are each 5 cm. Make angle X 70$^{o}$. Without using a protractor, calculate the measure of angles Y and Z.
(Answer: To calculate angles Y and Z: 180 – 70 = 120; 110 ÷ 2 = 55; each angle is 55$^{o}$.)
c. Draw triangle DEF where E is the right angle. Make DE 5 cm and FE 5 cm. Use a ruler to measure the length of DF. Without using a protractor, calculate the measure of angles D and F. (Answer: The length of DF is about 7 cm. The measure of angles D and F are 180 – 90 = 90; 90 ÷ 2 = 45$^{o}$ each.)

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once 6 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have the pupil with the correct answer come to the board to show their work and procedures to their peers.

**Closing** *(2 minutes)*

1. **Say:** Good job today. It can sometimes be difficult to work with a protractor. They are very helpful when comparing triangles. We were able to see that right triangles can be isosceles, but that having a right angle forces the base angles to each be 45$^{o}$. We could also see that the right angle forces the longer edge to be a specific length.
2. **Ask:** Does anyone have any questions about comparing right triangles and isosceles triangles?
3. Answer any questions that pupils may ask about comparing the 2 types of triangles.

| **Lesson Title:** Comparing Isosceles Triangle and Equilateral Triangle | **Theme:** Geometry Triangles | |
|---|---|---|
| **Lesson Number:** M-06-095 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

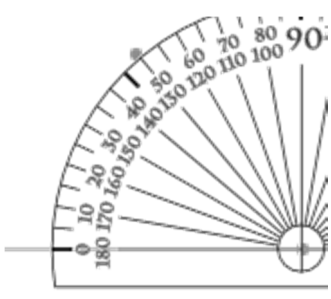
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to compare an isosceles triangle and an equilateral triangle. | **Teaching Aids**<br>Ruler, protractor | **Preparation**<br>Draw the triangles from the lesson on the board. |
|---|---|---|

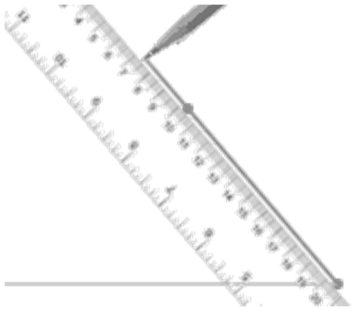
**Opening** *(5 minutes)*

1. **Say:** Today we are going to go more in depth on comparing isosceles triangles and equilateral triangles and the measurements of their sides and angles.
2. **Ask**: How did we draw isosceles triangles in the last lesson? (Answer: Draw two sides that have the same length and then draw the third side to connect the other two.)
3. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct answer, explain it to them.
4. **Ask**: How do we use a protractor to measure an angle? (Answer: Put the middle part of the bottom on an angle lining up the hole in the protractor to the vertex of the angle. If the angle is on the left, read the outside numbers. If the angle is on the right, read the inside numbers.)
5. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If a pupil gives a correct answer, have them model how to measure an angle. If none of the pupils give the correct answer, explain it to them and then show them again how to measure an angle.

**Introduction to the New Material** *(7 minutes)*

1. **Say**: We can use a protractor to create angles as well as measure them. We can then use those angles to draw a triangle. Use your ruler to draw a line that is 3 cm in your exercise books.
2. Draw out what you are saying on the board.
3. **Say**: Make a point at each end and name the one on the left B and the one on the right A. Put the middle part of your protractor on point A and put a dot at 50$^{o}$ because we will be drawing a 50 degree angle. Then use a ruler to draw a line from point A that extends beyond that dot.



4. Wait for pupils to complete step 3 before moving on.

5. **Say**: Put the middle part of your protractor on point B and put a dot at $50^o$. Remember that you have to use the inside numbers. Then use a ruler to draw a line from point B that extends beyond that dot.
6. Wait for pupils to do this before moving on.
7. **Say**: Make a point where the two new lines meet and call that point C. Erase any extra part of the lines so that you have a triangle ABC. This is how we use a protractor to create angles and draw triangles.

**Guided Practice** *(10 minutes)*

1. **Ask**: What type of triangle did we draw? How do you know it's that kind of triangle? (Answer: It is isosceles because two of the angles have the same measure.)
2. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct answer, give the answer.
3. **Ask**: What is the measure of angle C? (Answer: $180 – 50 – 50 = 80^o$).
4. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct answer, give the answer. Then have pupils measure angle C with their protractors to prove that it is $80^o$.
5. **Write**: $180 – 50 – 50 = 80^o$
6. **Say**: Use your ruler to measure the lengths of AC and BC.
7. **Ask**: What is the length of AC? What is the length of BC? (Answer: Both AC and BC are 2.3 cm.)
8. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct answer, give the answer. Show this on the board. Pupils might round off their answer to somewhere between 2.2 cm and 2.5 cm. Accept any answers in this range.
9. **Say**: We have just drawn an isosceles triangle with base angles of 50 degrees and legs of 2.3 cm.
10. **Say**: Use your ruler to draw another line that is 3 cm long in your exercise books. Make a point at each end and label one X and the other Y. Then use your protractor to make 60 degree angles at points X and Y. Label the point where the extended lines meet as point Z. Erase any extra parts of the line so that you have triangle XYZ.
11. As pupils are working, walk around and help them. Answer questions if they arise. Once five minutes is up, call attention to the board and show the construction.
12. **Ask**: What kind of triangle did we draw and why? (Answer: Equilateral, because if two angles are $60^o$, then the third angle has to be $60^o$.)
13. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct answer, give the answer. A pupil might say "isosceles, because two of the angles are the same angle". If a pupil says this, then show the calculation for the third angle (Answer: $180 – 60 – 60 = 60$)
14. **Say**: It is important to remember that an equilateral triangle also has angles that all measure 60 degrees.
15. **Say**: Without using a ruler or protractor, try to draw a right isosceles triangle. Remember that a right triangle has a degree with a measure of 90 degrees and you must determine the measures of the base angles.
16. **Ask**: What must the measures of the other two angles be? (Answer: 45 degrees each)

17. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct answer, show again how to use the protractor and determine the angle measures.
18. **Say**: For the right isosceles triangle where the leg lengths are 7 cm, the two base angles must be the same measure. In this case, they are each 45 degrees.
19. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct answer, give the answer.
20. Draw an isosceles triangle with legs lengths of 7 cm and the non-base angle anything other than $90^o$. Use the protractor to measure that angle.
21. **Ask**: How can we calculate the measures of the other two angles without a protractor? (Answer: Do 180 minus the measured angle then divide that number by 2).
22. Have pupils raise their hands to offer their answer. Call on 2 or 3 pupils for their responses. If none of the pupils give the correct answer. Then give the correct answer for the example you provided.

**Independent Practice** *(13 minutes)*

1. **Say**: You will do some work on your own now. Draw the requested triangles and answer the questions. You have eight minutes to work.
2. **Write** the following on the board:
    a. Draw isosceles triangle ABC with base angles that are each $15^o$. Make line AB 5 cm. Calculate the measure of angle C and use your ruler to measure the lengths of AC and BC. (Answer: The measure of angle C is 180 – 15 – 15 = 150. AC and BC are both about 2.6 cm.)
    b. Draw equilateral triangle XYZ with the first side XY as 4.5 cm. Use your ruler to measure sides XZ and YZ. Use your protractor at angle Z to make sure it is $60^o$. (Answer: Sides XZ and YZ should also measure 4.5 cm. Make sure pupils are using their rulers and protractors to check their work.)
    c. Draw line DE that is 4 cm long. At point D, make an angle that is $100^o$. At point E, make an angle that is $40^o$. Create triangle DEF. Measure sides DF and EF, then calculate the measure of angle F. Explain what kind of triangle you drew. If it is isosceles, explain what the base angles and the legs are. (Answer: The length of DE is about 4 cm. The length of EF is about 6 cm. The measure of angle F is $40^o$ (180 – 100 – 40 = 40). This is an isosceles triangle with base angles E and F because that are both $40^o$. The legs are DE and DF because they are both 4 cm.)
3. As pupils are working, walk around and help them as needed. Answer questions if they arise.
4. Once eight minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided. Have pupils with the correct answer come to the board to show their work and procedures to their peers.

**Closing** *(2 minutes)*

1. **Say:** Today, we were able to see that even if we create a triangle that seems isosceles at first, it can actually be equilateral when we calculate the measure of the third angle. Remembering the special features and definitions of equilateral and isosceles triangles is important to take

measurements. In the next lesson, we will be working more with arithmetic, with fractions and decimals.

2. **Ask:** Does anyone have any questions about comparing isosceles triangles and equilateral triangles?
3. Answer any questions that pupils may ask about comparing the two types of triangles.

| **Lesson Title:** Conversion from Fractions to Decimals | **Theme:** Numbers and Numeration; Decimals and Percentages | |
|---|---|---|
| **Lesson Number:** M-06-096 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to convert fractions to decimals. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to work with fractions and decimals again. We are going to practise converting from fractions to decimals. We have already worked with some of these skills, and we will continue working with them as well as practising our long division skills.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** We know that there are some fraction-to-decimal equivalents that we must know. We learned those already when we memorised the table of these common conversions. What happens when we need to change a fraction to a decimal and we cannot find an equivalent fraction with a power of 10 denominator? Raise your hand to answer. (Answer: You will divide.)
2. **Say:** Today we are going to work on converting all fractions to decimals. One thing we need to know is that the fraction bar just represents division.
3. **Write** $\frac{1}{4}$ on the board. Show pupils that the fraction one fourth really just tells us 1 divided by 4. We must use decimal long division to solve the problem to get the solution.
4. **Say:** Since we cannot divide 1 by 4, we must use long division to solve the problem. We do know that one fourth is equal to 0.25, but we now can prove it using the long division skills we learned earlier this year.
5. **Write** $4\overline{)1.00}$ Show pupils how to solve the problem using long division and solving the problem.
6. **Say:** We will use this same technique for other numbers. Let's try finding a decimal for one third.
7. **Write** $\frac{1}{3}$ on the board. Show pupils the long division for $3\overline{)1}$
8. Show them that the solution has a repeated decimal. $3\overline{)\begin{array}{r}0.33333\\1\end{array}}$
9. **Say:** Since this decimal goes on forever without stopping and it repeats the decimal, we can write that decimal conversion in a special way. We see that the 3 is repeating, so we write the decimal with a line over the repeated number.
10. **Write** the answer as a repeated decimal on the board for pupils to see. $3\overline{)\begin{array}{r}0.\overline{3}\\1\end{array}}$

**Guided Practice** *(10 minutes)*

1. **Write** 3 fractions on the board for pupils to convert to decimals:
    a. $\frac{3}{8}$ (Answer: 0.375)
    b. $\frac{5}{16}$ (Answer: 0.3125)
    c. $\frac{2}{9}$ (Answer: $0.\overline{2}$)
2. **Say:** Please copy these fractions into your exercise books. Use long division to find the decimal conversion of each of these fractions. If a decimal is repeated, please use the correct notation by putting a small line above the repeated digits.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions, including the long division, on the board to show pupils what is expected.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner. You may have repeated decimals as your answers. Write any repeated decimals with correct notation.
2. **Write** 5 examples on the board.
    a. $\frac{5}{8}$ (Answer: 0.625)
    b. $2\frac{7}{8}$ (Answer: 2.875)
    c. $\frac{17}{20}$ (Answer: 0.85)
    d. $\frac{2}{3}$ (Answer: $0.\overline{6}$)
    e. $\frac{8}{11}$ (Answer: $0.\overline{7}\overline{2}$)
3. Walk around and assist pupils as needed. Answer any questions that arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will go the other direction. We will convert from decimals to fractions.
2. **Ask:** Does anyone have any questions about converting from fractions to decimals?
3. Answer any question that pupils have about today's lesson.

| **Lesson Title:** Conversion from Decimals to Fractions | **Theme:** Numbers and Numeration; Decimals and Percentages | |
|---|---|---|
| **Lesson Number:** M-06-097 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to convert decimals to fractions. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to work with fractions and decimals again. We are going to practise converting from decimals to fractions. We have already worked with some of these skills, and we are going to continue working with them.
2. **Say:** You will need to remember decimal place value and how to find the lowest form of a fraction and these will be helpful for converting decimals to fractions.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** We know that place value relates to the denominator of a fraction. We know that we can write any decimal with a power of 10 denominator. This is our first step in converting from decimals to fractions. The second step is to then reduce our fractions to the lowest form.
2. **Write** 0.75 on the board. Show pupils that we can write 0.75 as $\frac{75}{100}$ because the 5 is in the hundredths place.
3. **Say:** This makes is an equivalent fraction to the decimal 0.75. We can reduce both the numerator and denominator by dividing by 25. This will give us our fraction in lowest form.
4. **Write** the reduction of the fraction on the board. $\frac{75\div25}{100\div25}=\frac{3}{4}$
5. **Say:** We know that 0.75 is equal to three fourths from our equivalence lesson, but if we forget, this is how we can convert to fraction form. Let's try another example.
6. **Write** 0.015 on the board. Show pupils that 0.015 can be written with a denominator of 1000 as $\frac{15}{1000}$ because the 5 is in the thousandths place. Show pupils how to reduce the fraction by dividing both the numerator and denominator by 5. $\frac{15\div5}{1000\div5}=\frac{3}{200}$
7. **Say:** We have shown that 0.015 converts to $\frac{3}{200}$ as a fraction.

**Guided Practice** *(10 minutes)*

1. **Write** 3 decimals on the board for pupils to convert to fractions.
   a. 0.625 (Answer: $\frac{625}{1000}=\frac{625\div125}{1000\div125}=\frac{5}{8}$)
   b. 0.36 (Answer: $\frac{36}{100}=\frac{36\div4}{100\div4}=\frac{9}{25}$)

c. 2.04 (Answer: $\frac{204}{100}=\frac{204\div4}{100\div4}=\frac{51}{25}=2\frac{1}{25}$)

2. **Say:** Please copy these decimals into your exercise books. Find the fraction conversion of each of these decimals. Remember to reduce to lowest form. Please convert to a mixed number when possible.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board to show pupils what is expected of them.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 5 examples on the board:
   a. 0.375 (Answer: $\frac{375}{1000}=\frac{375\div125}{1000\div125}=\frac{3}{8}$
   b. 0.66 (Answer: $\frac{66}{100}=\frac{66\div2}{100\div2}=\frac{33}{50}$)
   c. 0.85 (Answer: $\frac{85}{100}=\frac{85\div5}{100\div5}=\frac{17}{20}$ )
   d. 3.052 (Answer: $\frac{3052}{1000}=\frac{3052\div8}{1000\div4}=\frac{763}{250}=3\frac{13}{250}$
   e. 1.111 (Answer: $1\frac{111}{1000}$)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will begin to explore the idea of percentages and how they relate to fractions and decimals.
2. **Ask:** Does anyone have any questions about converting from fractions to decimals?
3. Answer any question that pupils have about today's lesson.

| **Lesson Title:** Conversion from Fractions to Percentages and from Percentages to Fractions | **Theme:** Numbers and Numeration; Decimals and Percentages | |
|---|---|---|
| **Lesson Number:** M-06-098 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to:<br>1. Convert fractions to percentages.<br>2. Convert percentages to fractions. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today our lesson will focus on percentages and how they relate to fractions. Percentages are another way that we can represent part of an amount. The special thing about percentages is that they always tell us how much a number is out of 100. Knowing that we are always taking percentages out of 100, it makes it quite straightforward to convert between percentages and fractions. This is the focus of today's lesson.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** The word 'per cent' literally means 'for each one hundred'. This helps us remember that when representing percentages as fractions, we always put our number over 100. We also write percentages with a special symbol to show that we are working with percentages.
2. **Write** 73% on the board.
3. **Say:** We read the number on the board as 'seventy-three per cent'. This number can also be written as a fraction. Because percentages tell us that it is the amount out of 100, we write 73 as our numerator and 100 as the denominator.
4. **Write** the fraction equivalent to 73% on the board. $\frac{73}{100}$
5. **Say:** Sometimes we have to know what percentage a fraction represents. In order to do that, we must find the equivalent fraction with a denominator of 100.
6. **Write** $\frac{2}{5}$ on the board. Then remind pupils how to find an equivalent fraction with a denominator of 100. Show $\frac{2}{5}=\frac{2\times 20}{5\times 20}=\frac{40}{100}$.
7. **Say:** Since two fifths can be written as the fraction 40 over 100, we can say that two fifths is equivalent to forty percent.
8. **Write** the equivalence on the board. $\frac{2}{5}=40\%$

**Guided Practice** *(10 minutes)*

1. **Write** the following 2 fractions and 2 percentages on the board for pupils to convert:
    a. $\frac{1}{2}$ (Answer: 50%)
    b. $\frac{17}{50}$ (Answer: 34%)
    c. 88% (Answer: $\frac{88}{100}=\frac{88\div4}{100\div4}=\frac{22}{25}$)
    d. 37% (Answer: $\frac{37}{100}$)
2. **Say:** Please copy these decimals into your exercise books. Find the conversion of each example. Remember to reduce to the lowest form.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board to show pupils what is expected of them.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 5 examples on the board:
    a. $\frac{7}{25}$ (Answer: 28%)
    b. $\frac{9}{20}$ (Answer: 45%)
    c. 85% (Answer: $\frac{85}{100}=\frac{85\div5}{100\div5}=\frac{17}{20}$)
    d. 5% (Answer: $\frac{5}{100}=\frac{5\div5}{100\div5}=\frac{1}{20}$)
    e. $\frac{1}{4}$ (Answer: 25%)
    f. 100% (Answer: $\frac{100}{100}=1$)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue working with percentages, but we will explore the relationship between decimals and percentages. More specifically we will convert from percentages to decimals.

2. **Ask:** Does anyone have any questions about converting from fractions to percentages?
3. Answer any question that pupils have about today's lesson.

| | | |
|---|---|---|
| **Lesson Title:** Conversion from Percentages to Decimals | **Theme:** Numbers and Numeration; Decimals and Percentages | |
| **Lesson Number:** M-06-099 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to convert percentages to decimals. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today our lesson will focus on percentages and how they relate to decimals. As we learned yesterday, percentages are another way that we can represent part of an amount. The special thing about percentages is that they always tell us how much out of 100. We also know that percentages are always out of 100. We can focus our conversions around the hundredths place today because that represents amounts out of 100.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** When we need to convert from percentages to decimals, we line our percent value up with the hundredths place and that converts our number to a decimal. You can also think of it as moving the decimal point to the left 2 places.
2. **Write** 83% on the board. Show pupils that if we line the 83 up with the hundredths place, we get the decimal equivalent of 0.83. Write this process on the board for pupils to see.
3. **Say:** It is possible that we are given decimal quantities to represent our percentages.
4. **Write** 93.5% on the board.
5. **Say:** In this case, we line up the 93 so that the 3 is in the hundredths place but there will also be a 5 in the thousandths place. If we think about moving our decimal point to the left 2 places, we see that our decimal equivalent of 93.5% is 0.935.
6. Write this representation on the board to show pupils. Show pupils that the ones digit in the percentage ends up in the hundredths place of our decimal and all the other place value digits go into place.

**Guided Practice** *(10 minutes)*

1. **Write** 6 percentages on the board for pupils to convert to decimals.
    a. 14% (Answer: 0.14)
    b. 87% (Answer: 0.87)
    c. 23.4% (Answer: 0.234)
    d. 7.84% (Answer: 0.0784)
    e. 142% (Answer: 1.42)
    f. 934.7% (Answer: 9.347)

2. **Say:** Please copy these examples into your exercise books. Find the conversion of each example.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board to show pupils what is expected of them.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 8 examples on the board:
    a. 67% (Answer: 0.67)
    b. 93% (Answer: 0.93)
    c. 2% (Answer: 0.02)
    d. 1.7% (Answer: 0.017)
    e. 18.5% (Answer: 0.185)
    f. 0.45% (Answer: 0.0045)
    g. 125.5% (Answer: 1.255)
    h. 900.3% (Answer: 9.003)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue working with percentages and decimals. We will learn to convert from decimals to percentages tomorrow.
2. **Ask:** Does anyone have any questions about converting from percentages to decimals?
3. Answer any question that pupils have about today's lesson.

| **Lesson Title:** Conversion from Decimals to Percentages | **Theme:** Numbers and Numeration; Decimals and Percentages | |
|---|---|---|
| **Lesson Number:** M-06-100 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to convert decimals to percentages. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to finish learning about how to convert between fractions, decimals and percentages. Our focus today will be on how to convert decimals to percentages.
2. **Say:** First, however, we should remember how to convert from percentages to decimals. We have to be familiar with place value and remember that percentages tell us how much out of 100. We were able to align our percentages up with the hundredths place to convert from percentages to decimals. We also said that we could think about the conversion as moving the decimal point 2 places to the left. We will use this same logic when we convert the opposite way.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** Let's look at an example of a decimal that we want to convert to a percentage.
2. **Write** 0.29 on the board.
3. **Say:** To think about this we can ask ourselves how many hundredths there are in the number. We know that if we converted 0.29 to a fraction, we'd say that we had twenty-nine hundredths or $\frac{29}{100}$. We use this same logic to convert to percentages. Using this logic, we know that 0.29 is equivalent to 29%. We an also see that we get that solution if we were to move the decimal point to the right 2 places to convert from the decimal form to the percentage. Let's try another one.
4. **Write** 0.862 on the board.
5. **Say:** This example is a little more challenging because we do not have an exact number of hundredths. But we do know that we can move the decimal point 2 places to the right. If we move the decimal point 2 places to the right, we see that 0.862 is equivalent to 86.2%.
6. Show how you move the decimal point 2 places to the right on the board as you explain the process verbally.
7. **Say:** Let's try 1 more example together as a class before you begin to try them on your own.
8. **Write** 1.8 on the board.
9. **Say:** This one is even more challenging because there are not enough decimals, and it can be difficult to see how many hundredths there are. In this example it is important to write in a zero at the end of the decimal to see the percentage easier.
10. Add a zero to the decimal on the board so that it reads 1.80.

11. **Say:** Now we can see that 1.8 is equivalent to 180%. Even when you move the decimal point 2 places to the right, you must remember to add the zero to the end of the number.

**Guided Practice** *(10 minutes)*

1. **Write** 6 decimals on the board for pupils to convert to percentages:
    a. 0.92 (Answer: 92%)
    b. 0.06 (Answer: 6%)
    c. 0.04 (Answer: 4%)
    d. 0.7 (Answer: 70%)
    e. 8.72 (Answer: 872%)
    f. 2.6 (Answer: 260%)
2. **Say:** Please copy these examples into your exercise books. Find the conversion of each example.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board to show pupils what is expected of them.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 8 examples on the board:
    a. 0.27 (Answer: 27%)
    b. 0.15 (Answer: 15%)
    c. 0.06 (Answer: 6%)
    d. 0.5 (Answer: 50%)
    e. 0.083 (Answer: 8.3%)
    f. 0.0074 (Answer: 0.74%)
    g. 74.1608 (Answer: 7416.08%)
    h. 82.7003 (Answer: 8270.03%)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We are going to continue working with percentages as we move forward. We will begin applying percentages to situations in the coming classes.
2. **Ask:** Does anyone have any questions about converting from decimals to percentages?
3. Answer any question that pupils have about today's lesson.

| **Lesson Title:** Percentage of a Quantity – Simple Problems | **Theme:** Everyday Arithmetic; Percentages | |
|---|---|---|
| **Lesson Number:** M-06-101 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to solve simple problems to find the percentage of a given quantity. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today's lesson is about finding the percentage of certain quantities. We will learn how to apply percentages to find the correct portion of a given amount. Remember that percentage is the portion of something out of 100. One common way that pupils use percentages is to figure out their grades. If a score on a math test is 41 out of 50, we know that can be represented as the fraction $\frac{41}{50}$ which then equates to 82%. We know how to do these things. Today we are going to explore percentages even further.

**Introduction to the New Material** *(10 minutes)*

1. **Write** '10% of 35 m' on the board. Read the problem as you write it.
2. **Say:** This prompt is asking for 10% of 35 metres. In order to solve this we need to remember that the word 'of' in math tells us to multiply. We then proceed to multiply 10% by 35. We can only multiply a percentage if it is converted to either a fraction or a decimal. It is your choice as to which you want to convert into because you will get the same answer with either. I will now show you how to get the solution using both the fraction and decimal representations of our percentage.
3. **Write** each solution on the board.
   - $\frac{10}{100} \times 35 = \frac{350}{100} = 3\frac{1}{2} m$ is the fractional representation
   - $0.1 \times 35 = 3.5m$ is the solution when using the decimal representation
4. **Say:** While both methods give the same solution, I am going to use the decimal representations of our percentages in notes. When it is time to do independent work, you can use whichever you prefer.
5. **Write** '15% of Le2000' on the board. Solve for the solution on the board. $0.15 \times 2000 = LE300$ Explain your solution as you write it on the board so pupils see the solution path and how you arrive at your answer. Show all the steps of the decimal multiplication to remind pupils how to perform the steps.

**Guided Practice** *(10 minutes)*

1. **Write** 3 problems on the board for pupils to solve:

a. 23% of 65 m (Answer: 14.95 m)
b. $18\frac{1}{2}\%$ of 22 kg (Answer: 4.07 kg)
c. 35% of 57 km (Answer: 19.95 km)

2. **Say:** Please copy these examples into your exercise books. Take your time and find the answer to each problem.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board to show pupils what is expected of them. Be sure to show the decimal multiplication. Emphasise that $18\frac{1}{2}\%$= 18.5% represented as a decimal is 0.185

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy all examples in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** 6 examples on the board:
    a. 27% of 100 km (Answer: 27 km)
    b. 45% of 64 kg (Answer: 28.8 kg)
    c. 57% of 15 L (Answer: 8.55 L)
    d. 100% of Le240,100 (Answer: Le240,100)
    e. 150% of 58 m (Answer: 87 m)
    f. 49.5% of 863 g (Answer: 427.185 g)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We are going to continue working with percentages as we move forward onto more complex problems involving percentage of a quantity.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Percentage of a Quantity – More Problems | **Theme:** Everyday Arithmetic; Percentages | |
|---|---|---|
| **Lesson Number:** M-06-102 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to solve more complex problems to find the percentage of a given quantity. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to continue what we did yesterday, but we will be solving more complex problems. Our information will be given to us in word problem form and will require us to think about what the problem is asking of us before we can solve it.

**Introduction to the New Material** *(10 minutes)*

1. **Write** a word problem on the board. Read the problem after you finish writing the problem on the board: A school has 750 pupils and 60% of them are boys. How many girls are there in the school? How many boys are there in the school? (Answer: 300 girls; 450 boys)
2. **Say:** This problem is asking us for the number of boys and girls at a school. We know the total population at the school and we know what percentage of pupils are boys. To solve this problem, we can find what percentage of pupils are girls. Since 60% of the pupils are boys, we know that the remaining 40% of the pupils must be girls. With this percentage, we are able to calculate the number of girls by finding out 40% of 750. We can solve this by multiplying.
3. **Write** the solution on the board along with all work: $0.40 \times 750 = 300$
4. **Say:** This solution tells us that there are 300 girls at the school. To find the number of boys, we can either find 60% of 750 or we can subtract 300 from 750. Through subtraction we know that there are 450 boys at the school. We need to take our time on these types of problems, so please do not rush through your work.

**Guided Practice** *(10 minutes)*

1. **Write** a word problem on the board. Read the problem after you finish writing the problem on the board: There were 1800 onions in a trader's basket. When he got to market, the trader noticed that 12% of the onions were bad and needed to be thrown away. How many onions did the trader throw away? If the trader sold 450 onions, what percentage of the original 1800 onions did he sell? (Answer: 216 onions were thrown away; the trader sold 25% of the original onions)
2. **Say:** Please copy this word problem into your exercise books. Then take your time to answer the questions.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.

5. Write the solutions on the board to show pupils what is expected of them. $0.12 \times 1800 = 216$ gives us the number of bad onions. To find the percentage of onions sold, we divide $450 \div 1800 = 0.25$. 0.25 tells us that the trader sold 25% of the original onions.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the word problem in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** the word problem on the board: The weekly market has space for 150 vendors to sell their goods. Last week, 72% of the vendor spaces were used. How many spaces were not used? How many spaces were used? (Answer: 42 spaces were unused; 108 spaces were used)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We are going to continue working with percentages as we move forward.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Profit and Loss as Percentages | **Theme:** Everyday Arithmetic; Percentages | |
|---|---|---|
| **Lesson Number:** M-06-103 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to solve problems of profit and loss as percentages. |  **Teaching Aids** None |  **Preparation** Write the word problems from the lesson on the board. |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to think about profit and loss in terms of percentages. A profit is how much someone earns or gains when they sell a product or good. A loss is how much a person loses in a particular endeavour.
2. **Say:** Most commonly these terms are used with businesses, but they can be applied to other things like farming. Today we will learn how to use profit and loss mathematically, and tomorrow we will apply these skills to word problems and real life applications.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** We are going to talk about profits as gains or increases. The first principle we need to fully understand for this is that we use 100% to represent the whole amount or the original amount. If we have a profit, or gain, we use percentages that are greater than 100% to represent that our values are growing. If we model losses, we subtract the percentage of the loss from 100% to model the amount of the loss from the original quantity. In short our percentage changes to 100% + (profit)% for a profit and to 100% - (loss)%.
2. **Write** the changes in percentage on the board to show pupils.
3. **Say:** Let's try some of these to see how this works.
4. **Write** 'Find the final distance for a 15% increase on 60 km' on the board. (Answer: 69 km)
5. **Say:** In this example, we are increasing 60 kilometres by 15%. We represent this by finding 115% of 60 km. We must add the 15% increase to the original percentage of 100%. We can then solve as though it was a regular percentage. Remember that we have to convert our percentages into either decimals or fractions. It is a little easier to use decimals, so that is what I am going to use for these examples.
6. **Write** the solution on the board: $1.15 \times 60 = 69$
7. Tell pupils that if we increase the distance of 60 kilometres by 15%, the resulting total distance would be 69 kilometres.
8. **Say:** Let's try an example of a loss. Remember, just as we had to add the profit to 100% for a gain, we must subtract our loss percentage from 100 to calculate the amount after the loss.
9. **Write** 'Find how much is remaining if there is a 12% loss in 15 acres of farmable land' on the board. (Answer: 13.2 acres)
10. **Say:** In this example, we are decreasing 15 acres of farmable land by 12%. We represent this by finding 88% of 15 acres. We must subtract 12% from 100% to accurately represent the loss. We can then solve as a regular percentage. Remember that we have to convert our percentages into either decimals or fractions. I am going to use decimals for this example.

11. **Write** the solution on the board: $0.88 \times 15 = 13.2$
12. Tell pupils that if we decrease the amount of farmable land by 12%, the remaining amount of farmable land is 13.2 acres.

**Guided Practice** *(10 minutes)*

1. **Write** 2 examples on the board:
    a. An increase of 36% from 380. (Answer: 516.8; 136% x 380= $1.36 \times 380 = 516.8$)
    b. A loss of 26% from 972. (Answer: 719.28; 74% x 972 = $0.74 \times 972 = 719.28$)
2. **Say:** Please copy these examples into your exercise books. Then take your time to solve the problems.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board to show pupils what is expected of them. Solutions are indicated after the answers above.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the examples into your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** the practice problems on the board:
    a. A profit of 18% on Le250,000 (Answer: 118% x 250,000= 1.18 x 250,000 = Le295,000)
    b. A loss of 7% from 12 L (Answer: 93% x 12 = .93 x 12 = 11.16 L)
    c. An increase of 72% on 8 (Answer: 172% x 8 = 1.72 x 8 = 13.76)
    d. A decrease of 64% from 57 (Answer: 36% x 57 = .36 x 57 = 20.52)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We are going to continue working with percentages as we move forward. Tomorrow we will be using the skills from today to solve simple word problems involving profit and loss as a percentage.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Word Problems Involving Profit and Loss as a Percentage | **Theme:** Everyday Arithmetic; Percentages | |
|---|---|---|
| **Lesson Number:** M-06-104 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to solve simple word problems involving profit and loss as percentage. |  **Teaching Aids** None |  **Preparation** Write the word problems for the lesson on the board. |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to continue working with profit and loss, but we will be solving real world problems in more complex ways. Today we need to be sure we keep track of what the problems are asking us so we know to add or subtract depending on profit or loss.

**Introduction to the New Material** *(10 minutes)*

1. **Write** a word problem on the board. Read the problem after you finish writing the problem on the board: Your family planted 2 acres of corn. Unfortunately there was a severe drought and your family lost 12% of the harvest. How many acres of corn was your family able to successfully harvest? How many acres of corn did your family lose due to the drought?
   (Answer: 1.76 acres of corn were successfully harvested; 0.24 acres of corn were lost due to the drought)
2. **Say:** This problem is asking us to figure out how much of the harvest was lost. We know how much corn was originally planted and we know the percentage that was lost. To solve this problem, we can find out how much of the harvest was not lost by subtracting 12% from 100%. That will give us how many acres were successfully harvested. We can then subtract that amount from the 2 acres that were planted to find out how many acres were lost due to drought.
3. **Write** the solution on the board along with all work: $0.88 \times 2 = 1.76$. Then write $2 - 1.76 = 0.24$
4. **Say:** This solution tells us that 1.76 acres of land were successfully harvested. We then see that 0.24 acres of corn were lost due to drought. We need to take our time on these types of problems, so please do not rush through your work.

**Guided Practice** *(10 minutes)*

1. **Write** a word problem on the board. Read the problem after you finish writing the problem on the board: There were 2400 oranges in a trader's basket. When he got to market, the trader noticed that 16% of the oranges were bad and needed to be thrown away. How many oranges was the trader able to keep? How many oranges did the trader throw away?
   (Answer: 2016 oranges were kept; the trader threw away 384 oranges)
2. **Say:** Please copy this word problem into your exercise books. Then take your time to answer the questions.

3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board to show pupils what is expected of them. $0.84 \times 2400 = 2016$ gives us the number of good oranges. To find the number of oranges thrown away, we subtract $2400 - 2016 = 384$. 384 tells us that the trader threw away that many oranges.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the word problem in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** a word problem on the board: Your uncle has the opportunity to buy the adjacent plot of land to his farm. He has said that with the new land his farmable area will increase by 43%. You know he currently has 12 acres of land. How much land will he have when he buys the new land? How much land is he gaining with his purchase? (Answer: 17.16 acres of land total; he will gain 5.16 acres of land)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We are going to continue working with percentages for one more day. Tomorrow we will explore simple interest.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Simple Interest | **Theme:** Everyday Arithmetic; Percentages | |
|---|---|---|
| **Lesson Number:** M-06-105 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to solve problems involving simple interest using a formula. |  **Teaching Aids** None |  **Preparation** Write the word problems for the lesson on the board. |

**Opening** *(3 minutes)*

1. **Say:** When we borrow money from a bank, or we put money in a savings account, we must think about simple interest. Interest is a percentage added onto an amount that is usually calculated yearly. We follow the same rules for solving percentage problems, but we must take into account time with simple interest.
2. **Say:** If you put money in a savings account, you are usually earning interest on the money. If you borrow money from a bank, the interest is money you owe on top of the money you borrowed. It is also added to the total amount.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** There is a standard formula we use for simple interest. Please copy it into your exercise books.
2. **Write** the formula on the board. $A = P(1 + rt)$
3. **Say:** In this formula, A represents the amount of money you have; P is the principle, or the amount of money originally invested or borrowed; r is the interest percentage; and t is the time the money has been earning interest. Let's try an example.
4. **Write** Le200,000 for 3 years at 5% per year on the board. (Answer: Le230,000)
5. **Say:** In this example P = 200,000; r = 0.05 (notice we wrote the rate as a decimal in order to multiply later when we plug it into the formula); and t = 3. When we plug it into the formula and solve, we get a solution that looks like this.
6. **Write** the solution on the board. $A = 200{,}000(1 + 0.05 * 3)$ $A = 200{,}000(1.15) = Le230{,}000$
7. **Say:** Remember, inside the parenthesis you need to do the multiplication first before adding to the 1 because the order of operations tells us to. The key to these problems is figuring out which numbers go with which variables in the formula and solving the problem carefully. We also have to write our rate as a decimal.

**Guided Practice** *(10 minutes)*

1. **Write** 3 examples on the board:
    a. Le5000 for 4 years at 7% per year. (Answer: Le6400; A = 5000(1 + 0.07*4)= $A = 5000(1 + 0.28)$= 5000(1.28) = 6400)

b. Le75 000 for 8 years at $1\frac{1}{4}$ % per year. (Answer: Le82 500, A = 75000(1+ 0.0125*8) =

$A = 75000\left(1+0.1\right)$)

c. Le1500 for 6 years at 5% per year. (Answer: Le1950; A=1500(1+ 0.05*6) =

$A = 1500\left(1+0.30\right)$)

2. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions. Write out your equations by plugging in values into the formula.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board to show pupils what is expected of them.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the word problem in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** a word problem on the board: Mr. Browne borrowed Le250,000 from the bank and was charged an interest rate of 8% per year. If he paid the loan off at the end 5 years, how much did he pay in total for his loan? How much did he pay in interest?
   (Answer: Mr. Browne paid Le350,000 in total for his loan; he paid Le100,000 in interest over 5 years.)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We have finished working with percentages. Our next set of lessons will be about time.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** 12-Hour and 24-Hour Clock | **Theme:** Measurement and Estimation; Time | |
|---|---|---|
| **Lesson Number:** M-06-106 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to calculate time between 2 events using the 12-hour and 24-hour clock. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Ask:** Who can tell me how many hours there are in 1 day? (Answer: 24 hours)
2. Have pupils raise their hands to provide an answer. Call on pupils until the give the correct answer.
3. **Say:** Very good. Yes, there are 24 hours in a day. Most of our clocks, though, tell us time in a 12-hour format. It is difficult, though, to calculate the amount of time between 2 events using 12-hour clocks. Today we are going to explore this idea, but first we are going to work with the 24-hour clock.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** The 24-hour clock does not break the day up into a.m. and p.m. It counts every hour in the day from 0 to 24. Any of the afternoon hours are added to 12. For example, 3:00 p.m. is 15:00 on the 24-hour clock. Because the hours don't repeat after midday, it is easier for us to calculate the time between 2 events using the 24-hour clock.
2. **Write** the following example on the board and read it to the class: What is the length of time between arrival and departure at Lagos airport? Arrival: 14:20. Departure: 16:50. (Answer: 2 hrs, 30 min)
3. **Say:** To solve this problem, we can write it as vertical addition. We then subtract hours from hours and minutes from minutes. When we finish subtracting, we see that there are 2 hours and 30 minutes between arrival and departure at Lagos airport.
4. **Write** the solution on the board:

$$\begin{array}{rrr} & hr & \text{min} \\ & 16 & 50 \\ - & \underline{14} & \underline{20} \\ & 2 & 30 \end{array}$$

5. **Say:** Let's try a similar problem that is slightly more difficult.
6. **Write** the following problem on the board and read it to the class: What is the length of time between arrival and departure at Accra airport? Arrival: 17:40. Departure: 18:15. (Answer: 35 min)
7. **Say:** We will solve this problem just like we did the last one. However, we will see that we need to borrow 60 minutes from the hours' column. We borrow just like we would in a traditional subtraction column, but we add 60 instead of 10 because 1 hour equals 60 minutes. If we borrow correctly, we see that there are 35 minutes between arrival and departure at Accra airport.

8. **Write** the solution on the board.

$$\begin{array}{rcc} & hr & \text{min} \\ & {\scriptstyle 17}\not{18} & {\scriptstyle 75}\not{15} \\ - & \underline{17} & \underline{40} \\ & 0 & 35 \end{array}$$

**Guided Practice** *(10 minutes)*

1. **Write** 2 examples on the board.
    a. What is the length of time between arrival and departure in Freetown airport?

    Arrival: 8:03. Departure: 13:54. (Answer: 5 hrs, 51 min; $\begin{array}{rcc} & hr & \text{min} \\ & 13 & 54 \\ - & \underline{8} & \underline{03} \\ & 5 & 51 \end{array}$ )

    b. What is the length of time between arrival and departure in Abidjan airport?

    Arrival: 11:52. Departure: 16:17. (Answer: 4 hrs, 25 min; $\begin{array}{rcc} & hr & \text{min} \\ & {\scriptstyle 15}\not{16} & {\scriptstyle 77}\not{17} \\ - & \underline{11} & \underline{52} \\ & 4 & 25 \end{array}$ )

2. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions. Be careful to stack your hours and minutes. If you need to borrow, remember that you are borrowing 60 minutes for each hour.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board to show pupils what is expected of them. Solutions are with the answers above.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the problems in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** the problems on the board:
    a. What is the length of time between arrival and departure in Nairobi airport?

    Arrival: 22:43. Departure: 23:54. (Answer: 1 hr, 11 min; $\begin{array}{rcc} & hr & \text{min} \\ & 23 & 54 \\ - & \underline{22} & \underline{43} \\ & 1 & 11 \end{array}$ )

    b. What is the length of time between arrival and departure in Johannesburg airport?

    Arrival: 17:12. Departure: 19:00. (Answer: 1 hr, 48 min; $\begin{array}{rcc} & hr & \text{min} \\ & {\scriptstyle 18}\not{19} & {\scriptstyle 60}\not{00} \\ - & \underline{17} & \underline{12} \\ & 1 & 48 \end{array}$ )

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We are going to continue working on time. Tomorrow we are going to calculate time between two events using a.m. and p.m.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** A.M. and P.M. | **Theme:** Measurement and Estimation; Time | |
|---|---|---|
| **Lesson Number:** M-06-107 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to calculate time between 2 events using a.m. and p.m. | **Teaching Aids**<br>None | **Preparation**<br>Draw two number lines for the introduction on the board. |

**Opening** *(3 minutes)*

1. **Say:** Today we will continue finding the time between 2 events. Today we will not work with the 24-hour clock, but will work with times given to us in a.m. and p.m. We think about these problems a little differently than we do with times on a 24-hour clock. We think of these as time elapsed rather than as a straight subtraction problem.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** If we want to know how much time elapses between 7:40 a.m. and 11:00 a.m., we can draw a number line. Using the number line, we can say that 20 minutes passes when we get to 8:00 a.m., and then there are 3 more hours until 11:00 a.m. The total time elapsed is 3 hours and 20 minutes.
2. **Draw** the number line on the board to illustrate the idea to pupils:


3. **Say:** We can draw a number line for each of these examples, or we can think about it in our heads. It is up to you. Let's think about another scenario.
4. **Write:** How much time elapses between 2:35 p.m. and 7:10 p.m.? (Answer: 4 hrs, 35 min).
5. **Say:** In this problem, we can break the time down into parts. We know that there are 25 minutes until 3:00 p.m. Then between 3:00 p.m. and 7:00 p.m., 4 hours passes. Lastly, another 10 minutes passes. When we put all these times together by addition, we can say that there are 4 hours and 35 minutes between 2:35 p.m. and 7:00 p.m.
6. **Draw** a number line on the board that shows the 3 intervals so pupils can see how the time fits together. Explain each of the parts on the number line as you tell pupils the answer.
7. **Say:** By using a number line we can easily see how the time elapses in different parts.

**Guided Practice** *(10 minutes)*

1. **Write** 2 examples on the board.
    a. How much time passes between 3:10 a.m. and 7:40 a.m.? (Answer: 4 hrs, 30 min)
    b. How much time passes between 7:40 a.m. and 1:05 p.m.? (Answer: 5 hrs, 25 min)

2. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions. Be careful to count your time in segments. Draw a number line to help you find your answer.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Draw number lines on the board to help with the solutions as you tell pupils the solutions.
6. **Say:** In our first example, we know that there are 50 minutes between 3:10 a.m. and 4:00 a.m. We then count 3 more hours between 4:00 a.m. and 7:00 a.m. Lastly, we know that there are 40 more minutes between 7:00 a.m. and 7:40 a.m. When we put this all together we end up with 3 hours and 90 minutes. Since 90 minutes is more than an hour, we rewrite it as 1 hour and 30 minutes. This tells us that our final answer for the elapsed time is 4 hours and 30 minutes. On the second example, we have to find the elapsed time between a.m. and p.m. Using a number line helps us not get confused with problems like this one. We know that there are 20 minutes between 7:40 a.m. and 8:00 a.m. Then we know that there are 5 hours between 8:00 a.m. and 1:00 p.m. Lastly we know there are 5 more minutes we must count. In total, the elapsed time between 7:40 a.m. and 1:05 p.m. is 5 hours and 25 minutes.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the problems in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** the problems on the board.
    a. How much time passes between 8:55 a.m. and 2:05 p.m.? (Answer: 5 hrs, 10 min)
    b. How much time passes between 1:05 a.m. and 9:40 a.m.? (Answer: 8 hrs, 35 min)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We are going to continue working on time. Tomorrow we will learn how to add and subtract using hours, minutes and seconds.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Addition and Subtraction with Time | **Theme:** Measurement and Estimation; Time | |
|---|---|---|
| **Lesson Number:** M-06-108 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to:<br>1. Add time in hours, minutes and seconds.<br>2. Subtract time in hours, minutes and seconds. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to build on our addition and subtraction skill in units of time. We learned how to subtract hours and minutes when we worked with elapsed time on the 24-hour clock. Now we are going to expand this skill to include addition and another unit, seconds.
2. **Ask:** How many seconds are in 1 minute? Raise your hand to answer. (Answer: 60 seconds are in 1 minute.)
3. **Ask:** When we were finding elapsed time on the 24-hour clock, how many minutes did we borrow from each hour? Raise your hand to answer. (Answer: 60 minutes for each hour)
4. **Say:** Very good. We use 60 when we borrow from hours for minutes and from minutes for seconds. We need to remember that our unit of measurement is in groups of 60 when we add or subtract. This is very important for our lesson today. We will also be stacking our addition and subtraction by units to ensure everything lines up correctly.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** Just as we did a few days ago, we will add and subtract hours with hours, minutes with minutes, and seconds with seconds. Let's start by trying an addition problem.
2. **Write**

| | *hr* | min | sec |
|---|---|---|---|
| | 2 | 15 | 30 |
| + | 7 | 25 | 14 |

on the board. (Answer: 9 hrs, 40 min, 44 sec). Show pupils that we can add each column to get our final answer.

3. **Say:** This problem was quite straightforward because we did not have to carry anything. Let's try another one that is a little more difficult.
4. **Write**

| | *hr* | min | sec |
|---|---|---|---|
| | 13 | 36 | 30 |
| + | 5 | 43 | 24 |

on the board. (Answer: 19 hrs, 19 min, 54 sec).

Show pupils the answer.

| | *hr* | min | sec |
|---|---|---|---|
| | 13 | 36 | 30 |
| + | 5 | 43 | 24 |
| | 18 | 79 | 54 |

5. **Say:** The problem with just adding the columns in this problem is we get 79 minutes. We need to change that to 1 hour and 19 minutes because 60 minutes equals 1 hour. This is the equivalent of carrying 1 hour. This gives us a final answer of 19 hours, 19 minutes and 54 seconds. Now lets try 1 example of subtracting in hours, minutes and seconds.

6. **Write**

$$\begin{array}{rccc} & hr & \text{min} & \text{sec} \\ & 6 & 18 & 27 \\ - & 2 & 05 & 50 \\ \hline \end{array}$$

on the board. (Answer: 4 hrs, 12 min, 37 sec). Show the work of the solution as you tell pupils the steps.

7. **Say:** We see in this example that we need to borrow from the minutes in order to subtract our seconds. When we borrow from the minute column, we must add 60 to the 27 seconds. This gives us 87 minus 50 which equals 37 seconds. Since we borrowed 1 minute, we now have 17 minutes minus 5 minutes. This leaves us with 12 minutes. The hours are straightforward, and we have 6 minus 2 hours, which leaves us with 4 hours. Our final answer is 4 hours, 12 minutes and 37 seconds.

**Guided Practice** *(10 minutes)*

1. **Write** 2 examples on the board.

a.

$$\begin{array}{rccc} & hr & \text{min} & \text{sec} \\ & 5 & 37 & 42 \\ + & 4 & 16 & 38 \\ \hline \end{array}$$

(Answer: 9 hrs, 54 min, 20 sec)

b.

$$\begin{array}{rccc} & hr & \text{min} & \text{sec} \\ & 11 & 56 & 13 \\ - & 7 & 59 & 42 \\ \hline \end{array}$$

(Answer: 3 hrs, 56 min, 31 sec)

2. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions. Be careful to borrow and carry correctly.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board and show pupils how to get each answer.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the problems in your exercise books and work independently. You will have 5 minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** the problems on the board.

a.

$$\begin{array}{rccc} & hr & \text{min} & \text{sec} \\ & 4 & 35 & 26 \\ + & 6 & 54 & 37 \\ \hline \end{array}$$

(Answer: 11 hrs, 30 min, 3 sec)

b.

| | *hr* | min | sec |
|---|---|---|---|
| | 6 | 00 | 00 |
| − | 5 | 53 | 52 |

(Answer: 0 hrs, 6 min, 8 sec)

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the 5 minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than 3 pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We will continue working on time. Tomorrow we will work with longer time intervals such as hours, months, weeks and days.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Time Intervals in Hours, Months, Weeks and Days | **Theme:** Measurement and Estimation Time | |
|---|---|---|
| **Lesson Number:** M-06-109 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to determine the number of months, weeks and days between two events. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to learn how to find out how much time is between two events. We will calculate the amount of time in days, weeks, and months. In order to be successful with this we must remember some basic things about elapsed time.
2. **Ask:** How many days are in a week? Raise your hand to answer. (Answer: 7)
3. **Say:** We also have to remember how many days each month has. We know that April, June, September and November all have 30 days and that February usually has 28 days. Every other month has 31 days. This is important when we calculate our answers.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** Let's look at an example to find the elapsed time between two events. Our start date is August 16, 1998 and the end date is April 9, 1999. To solve this problem we will use a T table. In the first column, you begin by writing the start date. Then you count forward towards the end time in smaller intervals. You will record the elapsed time in the middle column. The right most column helps you see where you end.
2. Draw a table on the board to represent the time between the two events as you explain the steps.

| Start date | Elapsed Time | End Time |
|---|---|---|
| August 16, 1998 | 7 months | March 16, 1999 |
| March 16, 1999 | 15 days | March 31, 1999 |
| March 31, 1999 | 9 days | April 9, 1999 |

3. **Say:** Once you create the table, you then add the elapsed time on in the middle column. In this case, we would see that the elapsed time is 7 months and 24 days. Since we have 24 days, we know that this is equivalent to 3 weeks and 3 days. The best way to write the elapsed time would be to say that the elapsed time is 7 months, 3 weeks, and 3 days.

**Guided Practise** *(10 minutes)*

1. **Write** two examples on the board:

a. Start Date: July 31, 2007 to End Date: November 17, 2008 (Answer: 1 year, 3 months, 2 weeks and 3 days)
b. Start Date: April 28, 1983 to End Date: September 10, 2001 (Answer: 18 years, 4 months, 1 week and 6 days)

2. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions. Be careful to count correctly to the end of the month. Remember which months have 30 days versus 31 days. Please make a table to help you organise your work.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. **Write** the solutions on the board and show pupils how to get each answer.

a.

| Start date | Elapsed Time | End Time |
|---|---|---|
| July 31, 2007 | 1 year | July 31, 2008 |
| July 31, 2008 | 3 months | October 31, 2008 |
| October 31, 2008 | 17 days | November 17, 2008 |
| | 1 year, 3 months, 17 days = 1 year, 3 months, 2 weeks and 3 days | |

b.

| Start date | Elapsed Time | End Time |
|---|---|---|
| April 28, 1983 | 18 years | April 28, 2001 |
| April 28, 2001 | 4 months | August 28, 2001 |
| August 28, 2001 | 3 days | August 31, 2001 |
| August 31, 2001 | 10 days | September 10, 2001 |
| | 18 years, 4 months, 13 days = 18 years, 4 months, 1 week and 6 days | |

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the problems in your exercise books and work independently. You will have five minutes to work. When you finish with your work, check your answers with a partner. Be sure to make a table to organise your work.
2. **Write** the problems on the board.
   a. Start Date: October 13, 2016 to End Date: May 09, 2022
   (Answer: 5 years, 6 months, 3 weeks and 5 days)
   b. Start Date: August 6, 1983 to End Date: January 25, 1990
   (Answer: 6 years, 5 months, 2 weeks, and 5 days)
   c. Start Date: September 17, 1983 to End Date: March 1, 2003
   (Answer: 19 years, 5 months, 1 week and 5 days)

3. As pupils are working, walk around and help them. Answer questions if they arise.
4. Once the five minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than three pupils per question.
5. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** We are going to finish working with time tomorrow and we will use all the skills we have learned so far to complete the next lesson.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Word Problems Involving Time between Two Events | **Theme:** Measurement and Estimation<br>Time | |
|---|---|---|
| **Lesson Number:** M-06-110 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to solve word problems involving calculations of time involving two events. |  **Teaching Aids**<br>None |  **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to apply what we've learned about elapsed time and apply it to real life situations. We will be combining elapsed time in longer and shorter periods of time. This will include hours, minutes and seconds, along with days, weeks and years. It is important that we keep in mind what the question is asking to know which unit we need to calculate to.

**Introduction to the New Material** *(10 minutes)*

1. **Write** a word problem on the board and read it to the class:
   Zinab was born on June 28, 2007. How old will she be on January 10, 2022?
   (Answer: 14 years, 6 months, 1 week and 6 days)
2. **Say:** This problem is asking us for elapsed time in years, months, weeks and days. We first need to identify the start and end dates. We see that the start date is June 28, 2007 and the end date is January 10, 2022. Then we can create a table as we did last class to find the elapsed time.
3. **Draw** a table on the board to represent the time between the two events as you explain the steps.

| Start date | Elapsed Time | End Time |
|---|---|---|
| June 28, 2007 | 14 years | June 28, 2021 |
| June 28, 2021 | 6 months | December 28, 2021 |
| December 28, 2021 | 3 days | December 31, 2021 |
| December 31, 2021 | 10 days | January 10, 2022 |
| | 14 years, 6 months, 13 days = 14 years, 6 months, 1 week and 6 days | |

4. **Say:** Once we figure out what the question is asking, we can easily solve the problem. Let's try another word problem together.
5. **Write** another word problem and read it to the class: Your brother left for Freetown on Tuesday at 3:15 pm. He returned on Friday at 10:30 am. For how long was your brother away?
   (Answer: 2 days, 19 hours, 15 minutes)
6. **Say:** This problem is asking us to find the amount of time using days, hours and minutes. We can use our table method again to find the elapsed time for this problem.
7. Draw a table on the board to find the elapsed time between the two events as you explain the steps.

| Start date | Elapsed Time | End Time |
|---|---|---|
| Tuesday at 3:15 pm | 2 days | Thursday at 3:15 pm |
| Thursday at 3:15 pm | 45 minutes | Thursday at 4:00 pm |
| Thursday at 4:00 pm | 18 hours | Friday at 10:00 am |
| Friday at 10:00 am | 30 minutes | Friday 10:30 am |
| | 2 days, 18 hours, 75 minutes = 2 days, 19 hours, 15 minutes | |

8. **Say:** We need to make sure we remember that there are 60 minutes in on hour and to change minutes to hours when our total is more than 60 minutes. We can use our table method to calculate any elapsed time between two events.

**Guided Practise** *(10 minutes)*

1. **Write** two examples on the board.
   a. The baby slept from 9:42 pm on Monday until 3:17 am on Tuesday. How long did the baby sleep? (Answer: 5 hours and 35 minutes)
   b. You started creating crafts for the market on Wednesday at 2:05 pm. The market is on Sunday starting at 9:00 am. How much time do you have to create your crafts? (Answer: You have 3 days, 18 hours and 55 minutes to work on your crafts.)
2. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions. Be careful to count correctly to the end of the month. Remember to convert lengths of time to bigger units if applicable. Please make a table to help you organise your work.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed. Assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board and show pupils how to get each answer.

**Independent Practise** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the problems in your exercise books and work independently. You will have five minutes to work. When you finish with your work, check your answers with a partner. Be sure to make a table to organise your work. These problems ask you to find elapsed time with all units.
2. **Write** the problems on the board:
   a) Your little brother was born on July 6, 2012 at 3:17am. Your little sister was born on April 4, 2015 at 2:46 pm. How much older is your little brother than your little sister? (Answer: 2 years, 8 months, 4 weeks, 1 day, 11 hours and 31 minutes)
   b) Aminata and Esther are friends. Aminata was born at 4:28 am on January 11, 2006. Ester was born on October 23, 2005 at 7:48 pm. How much older is Ester? (Answer: Esther is 2 months, 2 weeks, 4 days, 8 hours, and 40 minutes older than Aminata.)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the five minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than three pupils per

question. Have the pupil with the correct answer come to the board to show their work to their peers.

4. **Say:** We need to be careful with the answer to the first problem. We normally say that there are 4 weeks in one month, but as you can see in this problem, there are a little more than 4 weeks in a month. If we counted 9 months, we would have ended up at April 6, 2015, which is not enough time. We must write it as 4 weeks and 1 day to get an accurate response.

**Closing** *(2 minutes)*

1. **Say:** Next week we will be returning to geometry and angle measurements. We will work on finding angle measurements in different shapes and figures.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Sum of Angles in a Triangle | **Theme:** Geometry; Angles | |
|---|---|---|
| **Lesson Number:** M-06-111 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| **Learning Outcomes**<br>By the end of the lesson, pupils will:<br>1. Know that the sum of the angles in a triangle equals 180°.<br>2. Be able to solve simple problems finding one unknown angle in a triangle. | **Teaching Aids**<br>None | **Preparation**<br>None |
|---|---|---|

**Opening** *(3 minutes)*

1. **Say:** Today we are going to work on finding missing angles in triangles.
2. **Ask:** How many degrees are in a triangle? Raise your hand to answer. (Answer: 180°)
3. **Say:** This is the main thing we need to know about triangles. Remember that the sum of all of the angles in a triangle equals 180°. This is the most important fact for solving our examples today. We will use this fact in order to finding missing angles. We have worked with these ideas already this year, so it all won't be new.

**Introduction to the New Material** *(10 minutes)*

1. **Draw** a triangle on the board. Label the angles 15°, 92°, and x. (Answer: 73°)
2. **Say:** Looking at this triangle, we see that we don't know the size of each of the angles. We do know, however, that the sum of all the angles equals 180°. We can use this information to find the missing angle. To solve this, we subtract 15° and 92° from 180°.
3. **Write** the solution on the board for pupils to see how to solve. You can write the solution either vertically or horizontally.
   $180° - 92° = 88°$
   $88° - 15° - 73°$
4. **Say:** The solution is 73°. Let us try another example. We will need to find the missing angle.
5. **Draw** another triangle on the board. Label the angles: 30°, 60° and x. (Answer: 90°) Write the solution on the board for pupils to see how to solve. You can write the solution either vertically or horizontally.
   $180° - 30° = 150°$
   $150° - 60° = 90°$

6. **Say**: The solution is 90°.

**Guided Practice** *(10 minutes)*

1. **Write** four examples on the board. Be sure to write in the angles into triangles:
   a. 82°, 73°, x (Answer: 25°)
   b. 16°, 21°, x (Answer: 143°)

c. 45°, 45°, x (Answer: 90°)
d. 60°, 60°, x (Answer: 60°)

2. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions. Remember to draw your triangles and write out the subtraction to solve the problems.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed. Assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board and show pupils how to get each answer.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the problems in your exercise books and work independently. You will have five minutes to work. When you finish with your work, check your answers with a partner. Remember that you must write in the degrees sign (°) after all of the responses to tell me that your answer is in degrees.
2. **Write** some problems on the board:
   a. 25°, 134°, x (Answer: 21°)
   b. 72°, 54°, x (Answer: 54°)
   c. 41°, 110°, x (Answer: 29°)
   d. 86°, 63°, x (Answer: 31°)
   e. 112°, 37°, x (Answer: 31°)
   f. 86°, 59°, x (Answer: 35°)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the five minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than three pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue to look for missing angle values in triangles.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Finding Unknown Angles in a Triangle | **Theme:** Geometry; Angles | |
|---|---|---|
| **Lesson Number:** M-06-112 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to solve harder problems involving finding the unknown angle in a triangle. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to continue working on finding missing angles in triangles. Today's examples are going to require us to think a little more about the missing angles.
2. **Ask:** Who can tell me how we found a missing angle yesterday?
   (Answer: We subtracted the given angles from 180°. The result was the size of the missing angle.)
3. Have pupils raise their hands to volunteer answers. Call on two or three pupils to share their responses until someone gives the correct answer. If no one gives the correct response, quickly review how we got the correct answer in the last lesson.

**Introduction to the New Material** *(10 minutes)*

1. **Draw** a triangle on the board. Label the angles 80°, x, and x. (Answer: 50°)
2. **Say:** Looking at this triangle, we see that we don't know the size of each of the angles. We do know, however, that the sum of all the angles equals 180°. We also know that the two missing angles are the same measure because they are both labeled with an x. We can use what we know about equal sizes to solve this problem. First we will subtract 80° from 180°. This tells us that the two missing angles add to equal 100°. Since the angles are the same size, we can then divide 100° by 2 to see that each missing angle is equal to 50°.
3. **Write** the solution on the board while explaining the steps for pupils to see how to solve. $180° - 80° = 100°$ You can write the solution either vertically or horizontally. Then write out the division. $100° \div 2 = 50°$ for each angle.
4. **Say:** We can check our solution to make sure we solved the problem correctly. Since we know that the sum of the angles of a triangle equals 180°, we can add all of our angles up to see if they equal that amount.
5. Show pupils how to check their work. Write the following on the board to check the solution.
   *Check*:
   $80° + x + x = 180°$
   $80° + 50° + 50° = 180°$
   $130° + 50° = 180°$
   $180° = 180°$

6. **Say:** Since we checked our solution and we see that the angles sum to 180°, we know that we solved the problem correctly.

**Guided Practice** *(10 minutes)*

1. **Write** two examples on the board. Be sure to write the angles into triangles.
    a. 90°, x, 2x (Answer: x=30°; 2x=60°;
    $180° - 90° = 90°$
    $3x = 90°$
    $90° \div 3 = 30°$ )
    $x = 30°$
    $2x = 30° \times 2 = 60°$
    b. 80°, 2x, 3x (Answer: x=20°; 2x=40°; 3x=60°;
    $180° - 80° = 100°$
    $5x = 100°$
    $100° \div 5 = 20°$ )
    $x = 20°$
    $2x = 20° \times 2 = 40°$
    $3x = 20° \times 3 = 60°$
2. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions. Remember to draw your triangles and write out the work to solve the problems. Be sure to check your work.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed. Assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board and show pupils how to get each answer.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the problems in your exercise books and work independently. You will have five minutes to work. When you finish with your work, check your answers with a partner. Remember that you must write in the degrees sign (°) after all of the responses to tell me that your answer is in degrees and check your solutions to make sure you got the correct answer.
2. **Write** some problems on the board.
    a. 30°, x, x (Answer: x = 75°;
    $180° - 30° = 150°$
    $2x = 150°$ )
    $150° \div 2 = 75°$
    $x = 75°$
    b. 45°, x, x (Answer: x = 67.5°;
    $180° - 45° = 135°$
    $2x = 135°$ )
    $135° \div 2 = 67.5°$
    $x = 67.5°$
    c. 55°, 3x, x (Answer: x = 31.25°; 3x = 93.75°;

$180° - 55° = 125°$

$4x = 125°$

$125° \div 4 = 31.25°$

$x = 31.25°$

$3x = 3 \times 31.25 = 93.75°$

3. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the five minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than three pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue to look for missing angle values, but instead of working with triangles, we will work with quadrilaterals.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Sum of Angles in a Quadrilateral | **Theme:** Geometry; Angles | |
|---|---|---|
| **Lesson Number:** M-06-113 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Know that the sum of angles in a quadrilateral equals 360°.<br>2. Solve simple problems about unknown angles in quadrilaterals. | **Teaching Aids**<br>None | **Preparation**<br>None |
|---|---|---|

**Opening** *(3 minutes)*

1. **Ask:** What is a quadrilateral? (Answer: A figure with four sides.)
2. Have pupils raise their hands to offer their solutions. Call on two or three pupils to provide their answer until one gives the correct answer. If no one knows the right answer, remind pupils that quadrilaterals have four sides.
3. **Ask:** How many degrees does a quadrilateral have? (Answer: 360°)
4. Have pupils raise their hands to offer their solutions. Call on two or three pupils to provide their answer until one gives the correct answer. If no one knows the right answer, remind pupils that quadrilaterals have 360°.
5. **Say:** Today we are going to continue working on finding missing angles but rather than finding them in triangles we are going to find missing angles in quadrilaterals. We must use the fact that the sum of the angles in a quadrilateral equals 360°. Notice that the sum of the angles of a quadrilateral is double that of the sum in triangles. This is because there are two triangles that fit together in a quadrilateral so 180° + 180° = 360°.

**Introduction to the New Material** *(10 minutes)*

1. **Draw** a quadrilateral on the board. Label the angles 80°, 75°, 63°, x. (Answer: 142°)
2. **Say:** In this problem, we are looking for the missing angle. We know that the sum of the angles in a quadrilateral equals 360°, so we can subtract the angles that we know to find the missing angle.
3. Show the work on the board for pupils.
4. **Say:** When you subtract 360° minus 80° minus 75° minus 63°, we see that the remaining angle is equal to 142°. This means that the unknown angle measure is equal to 142°. Let us try another example.
5. **Draw** another quadrilateral on the board. Label the angles 93°, 86°, 92°, x. (Answer: 89°)
6. **Say:** We need to find the missing angle by subtracting the known angles from 360°.
7. Show the work on the board for pupils.
8. **Say:** As we can see, the missing angle is 142°. We use the same techniques we used for finding multiple missing angles in triangles for quadrilaterals.

**Guided Practice** *(10 minutes)*

1. **Write** two examples on the board. Be sure to write the angles in the sample quadrilaterals.
   a. 118°, 54°, 117°, x (Answer: x=71°; $360° - 118° - 54° - 117° = 71°$)
   b. 87°, 63°, x, 2x (Answer: x=70°; 2x=140°;
      $360° - 87° - 63° = 210°$
      $3x = 210°$
      $210° \div 3 = 70°$ )
      $x = 70°$
      $2x = 70° \times 2 = 140°$
2. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions. Remember to draw your quadrilaterals and write out the work to solve the problems. Be sure to check your work.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed. Assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
5. Write the solutions on the board and show pupils how to get each answer.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the problems in your exercise books and work independently. You will have five minutes to work. When you finish with your work, check your answers with a partner. Remember that you must write in the degrees sign (°) after all of the responses to tell me that your answer is in degrees and check your solutions to make sure you got the correct answer.
2. **Write** some problems on the board:
   a. 56°, 193°, x, x (Answer: x = 55.5°;
      $360° - 56° - 193° = 111°$
      $2x = 111°$ )
      $111° \div 2 = 55.5°$
      $x = 55.5°$
   b. 71.4°, 59.1°, 96.2°, x (Answer: x = 133.3°; $360° - 71.4° - 59.1° - 96.2° = 133.3°$)
   c. 86.3°, 128.9°, 3x, x (Answer: x = 36.2°; 3x = 108.6°;
      $360° - 86.3° - 128.9° = 144.8°$
      $4x = 144.8°$
      $144.8° \div 4 = 36.2°$
      $x = 36.2°$
      $3x = 3 \times 36.2 = 108.6°$
3. As pupils are working, walk around and assist as needed. Answer questions if they arise.
4. Once the five minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Have a pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue to look for missing angle values, but instead of working with triangles or quadrilaterals, we will work with composite figures.
2. Answer any questions that pupils have.

| **Lesson Title:** Angles in a Composite Figure | **Theme:** Geometry; Angles | |
|---|---|---|
| **Lesson Number:** M-06-114 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

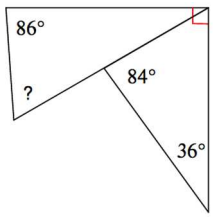
| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to solve simple problems in finding the unknown angle in a composite figure. | **Teaching Aids**<br>None | **Preparation**<br>Carefully draw the composite figures on the board for the lesson. |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to take what we know about finding missing angles of triangles and quadrilaterals and find missing angles of composite figures. Composite figures are figures that can be divided into multiple smaller shapes. Sometimes we are asked to find unknown angles in composite figures and we have to break the figure into smaller parts to find the angle size.

**Introduction to the New Material** *(10 minutes)*

1. **Draw** the following composite figure on the board:

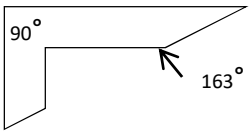



2. **Say:** We can see that this figure is made up of two triangles. We are also told by the little red square in the corner that that angle is equal to 90°. This figure has five sides so we are not sure how many total degrees are in the figure to find the missing angle. To solve this problem we are going to use what we know about the number of degrees in a triangle and what we know about right angles to find the missing angle measurement. We will start by looking at the triangle on the right. We know that a triangle has 180°. The triangle on the right has angle measures of 84° and 36° with one unknown angle. Using the method for solving for unknown angles in a triangle we can subtract 36° and 84° from 180° to see that the missing angle is equal to 60°.
3. **Write**: 180 – 36 – 84 = 60
4. Show pupils the subtraction on the board and point to the angle that you are solving for. Write in 60° into the triangle to show that angle measure.
5. **Say:** Now that we know one portion of the right angle, we can find the second portion of the right angle. We know that right angles equal 90°. Since we know that one part of the right angle is equal to 60°, we can subtract to see that the other part is equal to 30°.
6. Show pupils the top/left part of the right angle and write in 30° so they can see that the two parts of the right angle have actual measurements.

7. **Say:** Now that we know two angle measurements for the triangle with the unknown angle, we are able to solve for the unknown angle. The left triangle has angle measurements of 86° and 30°. Using that information and subtracting those measurements from 180°, we find that the unknown angle is equal to 64°. These problems have more steps, so we need work slowly and write all answers in as we go.

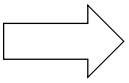
**Guided Practice** *(10 minutes)*

1. **Draw** the following composite figure on the board. (Answer: x = 17°)




2. **Say:** Please copy this figure in your exercise books. Try to solve for the missing angle x. To help you, think about the shapes you can break the image up to make finding x easier.
3. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed. Assist pupils as needed.
4. **Say:** Now that you have had time to work on the problems, I will explain how to find the answer. The easiest way to find the measure of angle x is to draw a vertical line up from the 63° angle to the top line. If the line you draw meets the top edge of the figure at a 90° angle, you have a right angle on the end of the figure. You can use the new right triangle to find the measure of angle x. We know that a triangle has 180°. If we subtract 90° and 163° from 180°, we find that angle x equals 17°.
5. Write the solutions on the board and show pupils how to get each answer.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the figure in your exercise books and work independently. Break up the figure into smaller triangles and quadrilaterals to help you visualise the problem. Then take your time and solve for the missing angle measurement. You will have five minutes to work. When you finish with your work, check your answer with a partner.
2. **Draw**  on the board. Write in 90° angle measurements into the left most two angles that look like the end of a rectangle. Write in 20° measurements on the top and bottom points on the arrow. Write in an x on the right most tip of the arrow. (Answer: x = 140°)
3. **Say:** In this problem, you are looking to find what angle the tip of the arrow makes.
4. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the five minutes is up, have pupils share their answers with partners. After two more minutes, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than three pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we are going to continue with this concept, but with more complex figures.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

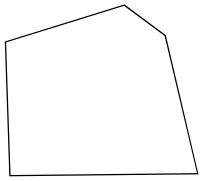
| **Lesson Title:** Angles in a Composite Figure | **Theme:** Geometry; Angles | |
|---|---|---|
| **Lesson Number:** M-06-115 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to solve harder problems in finding the unknown angle in a composite figure. | **Teaching Aids**<br>None | **Preparation**<br>Carefully draw the composite figures on the board for the lesson. |

**Opening** *(3 minutes)*

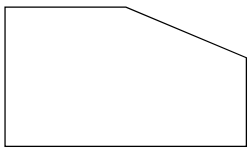
1. **Say:** Today we are going to continue finding missing angles in composite figures. Remember that we need to break our figure into smaller quadrilaterals and triangles in order to solve for any missing angles. We also have to remember that the sum of the angles in a quadrilateral is 360° and in a triangle is 180°.

**Introduction to the New Material** *(10 minutes)*



1. **Draw** the shape (at right) on the board. Write in angle measures going clockwise from the bottom left: 90°, 95°, 120°, x°, 75°.
2. **Say:** In this shape we are looking for angle x. This composite figure is harder to see, so we will have to break it down into one rectangle and two triangles.
3. **Draw** in a horizontal line perpendicular to the left side from the angle measuring 95° to the angle measuring x°. Then draw a vertical line down from the angle measuring x° to the bottom of the figure so it make a 90° angle on the bottom of the figure. You should have a top triangle and a right triangle.
4. **Say:** Now that we have put in right angles we can calculate the missing angles in the triangles. If we first look at the top triangle, we see that we have one angle on the left that is 5° and the top angle is 120°. Using these two measurements, we see that the right angle on the top triangle is equal to 55°. **Write** in the 55° on the angle. Then point to the right triangle and show pupils that we can calculate the top angle of the right triangle.
5. **Say:** The right triangle has a 90° angle on the bottom left and a 75° angle on the bottom left. Using this information we see that the top angle of the right triangle equals 15°. Using what we know about angle addition, we can see that x = 15° + 90° + 55°. This means that x = 160°.
6. Write the math on the board and show pupils where these angle measures are in the figure.
7. **Say:** These examples are more difficult but with patience and using what you know about triangles and quadrilaterals, we can easily find our missing angles.

**Guided Practice** *(10 minutes)*



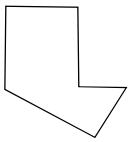
1. **Draw** the figure (at right) on the board. Write angle measures in the figure, clockwise from the bottom left: 90°, 90°, x, x, 90°.
2. **Say:** In this composite figure, we need to first find the value of x and then find the two unknown angle measures. This figure can be divided up into three parts to make finding the angle

measures easier. Take five minutes to see if you can find x. Start by drawing in the lines to break the composite figure into three easier pieces.

3. Let pupils work for five minutes. Walk around the room and assist as needed.
4. When five minutes is up, call attention to the front of the room. Draw in a horizontal line to make a bottom rectangle and draw in a vertical line to make another rectangle. The top right portion should be a triangle. The hard part about this problem is finding the angle measures of the triangle. Explain to pupils that since the obtuse top angle in the original figure is x and our vertical line takes out 90°, that the top angle in our triangle is equal to (xx – 90) °. Using that same logic, we see that the right angle in our triangle is equal to (x – 90) °. We also know that our two lines make the third angle of our triangle equal to 90°.
5. **Say:** Now that we have our angles in our triangles labelled, we can now solve for x. We know that x – 90 + x – 90 + 90 = 180°. Now we can solve for x.
6. Write the math solution on the board for pupils:
   $x-90+x-90+90=180$
   $2x-90=180$
   $2x=270$
   $x=135$
7. **Say:** Now that we know x equals 90, we can say that the two unknown angles are equal to 135°. We have to work slowly to ensure we don't make any mistakes.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. Please copy the figure in your exercise books and work independently. Break up the figure into smaller triangles and quadrilaterals to help you visualise the problem. Then take your time and solve for the missing angle measurement. You will have five minutes to work. When you finish with your work, check your answer with a partner.
2. Draw the figure (at right) on the board. Write in angle measurements starting from the bottom left as (3x + 90), 90°, 90°, 7x, 80°.



3. **Say:** In this problem, you are looking to see what x equals and to find the missing angles. (Answer: x = 10; 3x + 90 = 120°; 7x = 70°) You will have five minutes to solve this problem. Be sure to divide this figure into two pieces. Once five minutes is up, you will share in pairs. Be sure to copy the figure and all the angle measurements into your exercise books.
4. As pupils are working, walk around and assist as needed. Answer questions if they arise.
5. Once the five minutes is up, have pupils share their answers with partners. After two more minutes, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than three pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers. If no pupils have the correct answer, show them how to find the answer on the board.

**Closing** *(2 minutes)*

1. **Say:** Next class we are going to revisit sequences and patterns.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Sequence of Square Numbers | **Theme:** Algebra; Sequences | |
|---|---|---|
| **Lesson Number:** M-06-116 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
| **Learning Outcomes**<br>By the end of the lesson pupils will be able to:<br>1. Identify a sequence involving square numbers.<br>2. Find up to 10 terms of that sequence. | **Teaching Aids**<br>None | **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** Earlier this year we worked on sequences and various types of sequences. We are going to continue with some of that work, but we are going to specifically work with square numbers today.
2. **Ask:** What is a square number? (Answer: A square number is a number that is a square of another number.)
3. Have pupils raise their hands and call on two or three of them until someone provides the correct response.

**Introduction to the New Material** *(10 minutes)*

1. **Write** the following on the board: 1, 4, 9, __, (Answer: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100)
2. **Say:** Here we have a sequence. This is a pattern of perfect squares. We see that we have one squared, two squared, three squared, … Now we need to write out the next terms of the sequence so that we have a total of 10 terms.
3. Write out the rest of the sequence and explain to pupils how you are getting each term. (Answer: $4^2$= 16, $5^2$= 25, $6^2$= 36, $7^2$= 49, $8^2$= 64, $9^2$= 81, $10^2$=100)
4. **Say:** As you can see we are finding each term by squaring the next integer. We can use these square numbers to make other patterns. Make sure you copy these square numbers in your exercise books so that you have something to reference while we work with square numbers.
5. **Write** the following on the board: 3, 12, 27, __,
6. **Say:** We now have another sequence on the board. We want to write the first 10 terms of this sequence.
7. **Ask:** Can anyone tell me what the pattern is for this sequence?
   (Answer: We take the square number and multiply it by three.)
8. Have pupils raise their hands to provide their responses. Call on 2 or 3 pupils to give their responses. If no one gives the correct response, tell pupils the correct answer. Then write the first 10 terms of the sequence on the board. (Answer: 3, 12, 27, 48, 75, 108, 147, 192, 243, 300)
9. **Say:** The pattern is multiplying the square numbers by three. We take the numbers of the first sequence we wrote of perfect squares and multiply each number by 3. The first ten terms of the sequence are 1 x 3 = 3, 4 x 3 = 12, 9 x 3 = 27, 16 x 3 = 48, 25 x 3 = 75, 36 x 3 = 108, 49 x 3 = 147, 64 x 3 = 192, 81 x 3 = 243, and 100 x 3 = 300.

**Guided Practice** *(10 minutes)*

1. **Say:** I will write two examples on the board. Please describe the pattern in words and write out the first ten terms of the sequence.
2. **Write** two examples on the board.
   a. 16, 25, 36, __, (Answer: Square numbers starting with four squared, or 16; 16, 25, 36, 49, 64, 81, 100, 121, 144, 169)
   b. 8, 18, 32, __, (Answer: Square numbers starting with two squared, or four, and multiplied by 2.; 8, 18, 32, 50, 72, 98, 128, 162, 200, 242)
3. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions.
4. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed. Assist pupils as needed.
5. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
6. Write the solutions on the board and show pupils how to get each answer.
7. **Say:** These were a little more difficult that our first examples because they did not start with 1 or a multiple of one squared. They started with larger square numbers from the perfect square sequence. You will use this for the base and find the sequences involving square numbers.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. You are expected to describe the sequence in words and write out the first 10 terms of the sequence. Please copy the problems in your exercise books and work independently. You will have five minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** some sequences on the board:
   a. 5, 20, 45, __, (Answer: Squared numbers multiplied by 5; 5, 20, 45, 80, 125, 180, 245, 320, 405, 100)
   b. 16, 36, 64, __, (Answer: Squared numbers, starting with 2 squared, or 4, multiplied by 4; 16, 36, 64, 100, 144, 196, 256, 324, 400, 484)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise.
4. Once the five minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than three pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue to work with sequences of square numbers, but we will be writing more rules from our descriptions tomorrow.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Rule of Sequences Involving Square Numbers | **Theme:** Algebra; Sequences | |
|---|---|---|
| **Lesson Number:** M-06-117 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to describe a rule for sequences involving square numbers. | **Teaching Aids**<br>None | **Preparation**<br>None |
|---|---|---|

**Opening** *(3 minutes)*

1. **Say:** Earlier this year we worked on sequences and various types of sequences. Today we are going to continue working with square sequences.
2. **Ask:** What are the first twelve square numbers in a sequence? (Answer: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144)
3. Have pupils raise their hands to provide the answers. Call on pupils with their hands raised. Write the numbers on the board as pupils provide the list.
4. **Say:** Just as we did yesterday, we are going to identify sequences with square numbers and we will write a description of the pattern.

**Introduction to the New Material** *(10 minutes)*

1. **Write** the following on the board: 2, 4, 8, 16, __, __,
   **Ask:** How are the terms of this sequence changing?
   (Answer: Terms are being multiplied by 2 in order to get the next term.)
2. Have pupils raise their hands to offer their answers. Call on pupils until someone accurately describes the sequence.
3. **Ask:** Is this a sequence that uses square numbers? (Answer: No)
4. Have pupils raise their hands to offer their answers.
5. **Say:** We can identify patterns that do not use square numbers and we can describe them. Today we are going to describe sequences and tell whether they are sequences of square numbers.
6. **Write** another example on the board: 0.5, 2, 4.5, 8, __, __,
7. **Say:** This sequence is more difficult to describe. This sequence can be described as the perfect squares divided by 2. This is more difficult to see, but when we apply the rule, we see that it is true. This sequence would be considered a sequence of square numbers.

**Guided Practice** *(10 minutes)*

1. **Say:** Now you will try some. For these examples I want you to describe what is happening in the sequence and tell whether the sequence is of square numbers. Be sure to copy the examples and write your solutions in your exercise books.
2. **Write** two examples on the board:
   a. 3, 6, 11, __, __, (Answer: Square numbers plus 2; Yes)

b. 12, 19, 28, __, __, (Answer: Square numbers starting with three squared plus 3; Yes)

3. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions.
4. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed. Assist pupils as needed.
5. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
6. Write the solutions on the board and show pupils how to get each answer.
7. **Say:** These were a little more difficult that our first examples because they did not start with 1 or a multiple of one squared. They started with larger square numbers.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. You are expected to describe the sequence in words and tell whether it is a sequence of square numbers. Please copy the problems in your exercise books and work independently. You will have five minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** some sequences on the board:
   a. 5, 9, 19, __, __, (Answer: Squared numbers multiplied by 2 plus 1; Yes)
   b. 5, 9, 13, __, __, (Answer: Terms multiplied by 4 plus 1; No, it is not a sequence of squared numbers.)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise.
4. Once the five minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than three pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue to work with sequences of numbers, but we will be working with cube numbers rather than square numbers.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Sequence of Cube Numbers | **Theme:** Algebra; Sequences | |
|---|---|---|
| **Lesson Number:** M-06-118 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Identify a sequence involving cube numbers.<br>2. Find up to 10 terms of that sequence. |  **Teaching Aids**<br>None |  **Preparation**<br>None |

**Opening** *(3 minutes)*

1. **Say:** The past two days we have been working with sequences of square numbers. Today we are going to talk about cube numbers. Remember that when we cube something we multiply it by itself three times. We are first going to write the first twelve cube numbers on the board so we know what they are.
2. Write the first ten cube numbers on the board and remind pupils how we get them as you write them: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, 1331, 1728.
3. **Say:** We are going to identify patterns that use these numbers and eventually we will describe patterns that use these numbers.

**Introduction to the New Material** *(10 minutes)*

1. **Write** the following on the board: 3, 10, 29, __, __,
2. **Ask:** How are the terms of this sequence changing?
   (Answer: The terms are cube numbers plus 2.)
3. Have pupils raise their hands to offer their answers. Call on pupils until someone accurately describes the sequence.
4. **Ask:** Is this a sequence that uses cube numbers? (Answer: Yes)
5. Have pupils raise their hands to offer their answers.
6. **Say:** Since we know that this pattern is cube numbers plus 2, we can write out the first ten terms of the sequence.
7. **Write** the first ten terms on the board. (Answer: 3, 10, 29, 66, 127, 218, 345, 514, 731, 1002)
8. **Say:** Not all patterns add a number to them. We can subtract, multiply or divide patterns by numbers as well. Let's see if another example is a pattern with cube numbers.
9. **Write** the following on the board: 2, 8, 18, __, __,
10. **Say:** This pattern looks like it could be cubes, but the pattern doesn't seem right. The first term is either plus one or times two, but the second term is equal to the cube number. Since we cannot find a standard pattern with the cube numbers, we would say that this is not a pattern with cube numbers. I will tell you that it is a pattern with square numbers though. This sequence multiplies the square numbers by 2. Since we are focusing on cube numbers and this sequence works with square numbers, we will not write the first 10 terms of this sequence. Make sure you look carefully at the pattern to ensure that we are working with cube numbers.

**Guided Practice** *(10 minutes)*

1. **Say:** Now you will try some. For these examples I want you to describe what is happening in the sequence and tell whether the sequence is of square numbers. If it is a sequence of square numbers, please write the first ten terms of the sequence.
2. **Write** two examples on the board.
   a. -2, 5, 24, __, __, (Answer: Cube numbers minus 3; Yes; -2, 5, 24, 61, 122, 213, 240, 509, 726, 997)
   b. 3, 24, 81, __, __, (Answer: Cube numbers times 3; Yes; 3, 24, 81, 192, 375, 648, 1029, 1536, 2187, 3000)
3. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions.
4. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed. Assist pupils as needed.
5. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
6. Write the solutions on the board and show pupils how to get each answer.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. You are expected to describe the sequence in words and tell whether it is a sequence of cube numbers. Please copy the problems in your exercise books and work independently. You will have five minutes to work. When you finish with your work, check your answers with a partner.
2. **Write** some sequences on the board.
   a. 0.5, 4, 13.5, __, __,
   (Answer: Cube numbers divided by 2; Yes; 0.5, 4, 13.5, 32, 62.5, 108, 171.5, 256, 364.5, 500)
   b. 3, 17, 55, __, __,
   (Answer: Cubed numbers times 2 plus 1; Yes; 3, 17, 55, 129, 251, 433, 687, 1025, 1459, 2001)
3. As pupils are working, walk around and assist as needed. Answer questions if they arise.
4. Once the five minutes is up, call attention to the board and have pupils raise their hands to offer their responses. Call on pupils until the correct answer is provided, but no more than three pupils per question. Have the pupil with the correct answer come to the board to show their work to their peers.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue to work with sequences of cube numbers, but we will focus on finding rules of the sequences.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Rule of Sequences Involving Cubed Numbers | **Theme:** Algebra; Sequences | |
|---|---|---|
| **Lesson Number:** M-06-119 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| | | |
|---|---|---|
|  **Learning Outcomes** By the end of the lesson, pupils will be able to describe a rule for sequences involving cube numbers. |  **Teaching Aids** None |  **Preparation** None |

**Opening** *(3 minutes)*

1. **Say:** Today we are going to continue with what we were doing yesterday, but we will not be writing out the terms of the sequence. We will only be describing a rule for sequences of cube numbers.
2. **Ask:** What are the first ten cube numbers? (Answer: 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000)
3. Have pupils raise their hands to volunteer to answer the question. Call on pupils until the list is created. Write the list of the first ten cube numbers on the board as pupils get the correct numbers.

**Introduction to the New Material** *(10 minutes)*

1. **Write** the following on the board: -4, 3, 22, __, __,
2. **Say:** We can describe this sequence as cubed numbers minus five. This is the description of the rule for the sequence. All of our descriptions today will involve cube numbers.
3. **Write** the following on the board: $1,\frac{1}{8},\frac{1}{27}$ __, __,
4. **Ask:** How would we describe this sequence? Is it a sequence involving cube numbers? (Answer: Yes. This is the reciprocal of the cube numbers or the numbers over 1 as a fraction.)
5. Give pupils 2 minutes to write down the sequence and think about the pattern. Once the two minutes is up, have pupils think about the sequence and raise their hands if they have an answer. Call on pupils until the correct answer is given.
6. **Say:** Sequences can come in many forms. We have primarily been working with sequences that have cube or square numbers in the numerator. This example shows us that we can make sequences out of the denominator as well. It is a little more difficult to identify, but we can work with them.

**Guided Practice** *(10 minutes)*

1. **Say:** Now you will try some. For these examples I want you to describe what is happening in the sequence. You should be describing a rule that works for all terms.
2. **Write** two examples on the board.
   a. $\frac{1}{3},\frac{8}{3},9$ __, __, (Answer: Cube numbers divided by 3)

b. $2, \frac{1}{4}, \frac{2}{27}$ __, __, (Answer: 2 divided by cube numbers or 2 over the cube number)

3. **Say:** Please copy these examples into your exercise books. Then take your time to find your solutions.
4. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed. Assist pupils as needed.
5. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
6. Write the solutions on the board and show pupils how to get each answer.
7. **Say:** These were a little more difficult that our first examples because they involved fractions and the second one had the cube number in the denominator. Fractions are always harder to see because we have to reduce our fraction so the pattern is not always obvious.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. I want each of you to come up with two sequences that use cube numbers. You will have five minutes to create your sequences. Then you will switch sequences with partners and try to describe the sequence of cube numbers that your partner wrote. After three minutes of figure out the rule, you will check your responses with your partner.
2. As pupils are working, walk around and assist as needed. Answer questions if they arise.
3. Once the five minutes is up, call attention and have pupils switch papers with partners. Give them three minutes to figure out the rules for their partner's sequence. Then have them discuss the rule to see if they were correct.
4. **Ask:** Does anyone want to share a pattern they came up with that was unique or particularly challenging?
5. Have pupils raise their hands to volunteer sequences and rules. Call on 1 or 2 pupils to share their work.

**Closing** *(2 minutes)*

1. **Say:** Tomorrow we will continue to work with sequences, but with triangular numbers.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any question that pupils have.

| **Lesson Title:** Sequences Involving Triangular Numbers | **Theme:** Algebra; Sequences | |
|---|---|---|
| **Lesson Number:** M-06-120 | **Class/Level:** Primary 6 | **Time:** 35 minutes |

| **Learning Outcomes**<br>By the end of the lesson, pupils will be able to:<br>1. Identify a sequence involving triangular numbers.<br>2. Find up to 10 terms of that sequence. | **Teaching Aids**<br>None | **Preparation**<br>Draw the triangular sequence pattern from the opening on the board. |
|---|---|---|

**Opening** *(3 minutes)*

1. **Say:** Today we are going to finish up our lessons on sequences. We are going to work with a very special sequence called triangular numbers. We discussed these briefly earlier in the year when we were working with sequences originally. Today we are going to focus completely on them. Triangular numbers give you the sequence 1, 3, 6, 10, 15, and so on. They are called triangular numbers because they are the number of pieces you need to make a triangle. I will show you what that means.
2. **Draw** this pattern on the board:

3. **Say:** If this pattern represents the sequence of triangular numbers, we see that the first term has 1 dot, the second has 3 dots, the third 6 dots and so on. We can visually see that to get triangular numbers visually, we are just adding another row to the bottom of the triangle with one more dot than the previous row above it. Please copy the pattern and the visual representation on the board.

**Introduction to the New Material** *(10 minutes)*

1. **Say:** Now that we have the first five terms of a triangular sequence figured out, we need to write down the next five terms so that we have the first ten terms of the sequence to reference. We know that we are adding to get the next term. Copy the rest of the sequence in your exercise books.
2. Have pupils take out their exercise books and copy the rest of the sequence on the board. 1, 3, 6, 10, 15, 21, 28, 36, 45, 55.
3. **Say:** We could continue this pattern forever and still have only triangular numbers.
4. **Write** the following sequence on the board: 2, 6, 12, __, __,
5. **Say:** Now let's look at the new sequence on the board. We need to decide if it is a sequence involving triangular numbers. We can see that this sequence is the triangular numbers times 2. Since we know what the pattern is and it involves triangular numbers, we can find the first ten terms of the number. In your exercise books, please write down the first ten terms of the sequence.

6. **Write** the first ten terms of the new sequence on the board. 2, 6, 12, 20, 30, 42, 56, 72, 90, 110.
7. **Say:** The key to recognising a triangular sequence is remembering the base sequence. It is not as straight forward as some of the other special sequences we have worked with.

**Guided Practice** *(10 minutes)*

1. **Say:** Now you will try some. For these examples I want you to decide if the sequence involves triangular numbers. If so, I want you to find the first 10 terms of that sequence.
2. **Write** two examples on the board.
   a. 3, 10, 21 __, __, (Answer: Yes it does involve triangular numbers. It is ever other triangular number. 3, 10, 21, 36, 55, 78, 105, 136, 171, 220)
   b. $1, \frac{1}{3}, \frac{1}{6}$ __, __, (Answer: Yes, it involves triangular numbers. It is the reciprocal of the triangular numbers. $1, \frac{1}{3}, \frac{1}{6}, \frac{1}{10}, \frac{1}{15}, \frac{1}{21}, \frac{1}{28}, \frac{1}{36}, \frac{1}{45}, \frac{1}{55}$)
3. **Say:** Copy these examples in your exercise books. Then take your time to find your solutions.
4. Have pupils work for 7 minutes. Walk around the room and assist pupils as needed.
5. **Say:** Now that you have had time to work on the problems, we will go over the solutions.
6. Write the solutions on the board and show pupils how to get each answer.
7. **Say:** These were a little more difficult that our first examples because they involved every other term in the original sequence and the reciprocals of the numbers. We have to be very careful with the sequences to make sure we know what is going on.

**Independent Practice** *(10 minutes)*

1. **Say:** Now you will practise on your own. I want each of you to come up with two sequences that use triangular numbers. You will have five minutes to create your sequences. Then you will switch sequences with partners and try to describe the sequence of triangular numbers that your partner wrote. You will also write the first ten terms of the sequence. After three minutes, you will check your responses with your partner.
2. As pupils are working, walk around and assist as needed. Answer questions if they arise. Once the five minutes is up, call attention and have pupils switch papers with partners. Give them three minutes to figure out the rules for their partner's sequence. Then have them discuss the rule to see if they were correct.
3. **Ask:** Does anyone want to share a pattern they came up with that was unique or particularly challenging?
4. Have pupils raise their hands to volunteer sequences and rules. Call on 1 or 2 pupils to share their work.

**Closing** *(2 minutes)*

1. **Say:** We are now done working with sequences.
2. **Ask:** Does anyone have any questions about today's lesson?
3. Answer any questions that pupils have.